Agriculture Department
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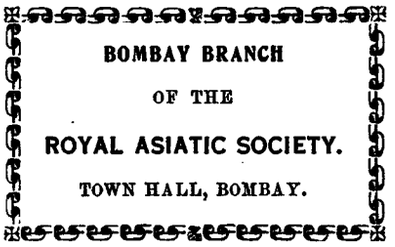
operations, 1910-11 To 1914-15



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REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE,

134070

MADRAS PRESIDENCY

BOMBAY GEOGRAPHICAL SOCIETY

FOR THE OFFICIAL YEAR

1910-1911.

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Administrative report of the Agricultural stations	..
Report on the College of Agriculture, Coimbatore	..
Government Botanist's report	4
Madras Agricultural Chemist's report	
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REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE

FOR

1910–1911.

I.—STAFF.

I remained in charge of the office of Director of Agriculture throughout the whole year under report. I spent 142 days on tour, and inspected all the agricultural stations, and visited the Coimbatore College on nine occasions. I also attended the annual meeting of the United Planters' Association of Southern India at Bangalore in August.

2. Mr. Sampson availed himself of one month's privilege leave in May, and Assistant Director M.R.Ry. D. Ananda Rao Garu was placed in charge of the current duties of his office. No other changes occurred in the superior staff of the department. In G.O., Mis. No. 65, Revenue, dated 9th January 1911, the second post of Assistant Director of Agriculture was filled up by the appointment of M.R.Ry. K. Ramasastrulu Nayudu Garu, a graduate of the California University on probation. He had been under training on the Coimbatore Farm since April 1910 as a Second-grade Manager. He was posted to work under the Deputy Director of Agriculture, Southern Division, with his head-quarters at Trichinopoly for the present. Assistant Director M.R.Ry. D. Ananda Rao Garu has been deputed for a year's training in farm-management under the Principal on the Central Farm.

Application was made during the year for sanction for the appointment of an European Entomologist. Orders have not yet been received on this. Mr. Sampson having applied for six months leave from 23rd April 1911, the services of Mr. H. Southern, Probationary Agriculturist, were obtained from the Inspector-General, and in order that Mr. Southern might familiarize himself with the work before taking charge, he was deputed to this Presidency in February and worked under Mr. Sampson till that Officer took leave in April. Mr. Southern is now in charge of the Southern division.

II.—SCIENTIFIC AND NATIONAL ENQUIRY.

A.—Entomology.

3. The Imperial Entomologist Mr. H. M. Lefroy visited Coimbatore in May and spent some time there, thoroughly examining the collections. He also examined the records and drew up a programme of work for the year. The monthly reports of the Entomological Assistants are being sent to the Imperial Entomologist for remarks and advice. The department is much indebted to Mr. Lefroy and his successor for their help and advice. The chief outbreaks of insect pests in the year were the swarming caterpillar on paddy in Malabar, the hairy caterpillar on cumbu in South Arcot, the rice bug in South Canara and the Deccan grasshopper on cholam in Bellary. These were all investigated on the spot by the Entomological Assistants, and leaflets prepared in the case of the first three pests and issued on a large scale in the vernacular for distribution in the affected tracts. Some promising experiments on trapping the Deccan grasshopper were made by Entomological Assistant M.R.Ry. Y. Ramachandra Rao. This and other remedies will be tested and demonstrated again this year on a larger scale. The pest is a very serious one, as the whole cholam crop is destroyed in some localities. It is interesting to note that the pest has been the means of increasing the area under Dharwar American cotton which does not suffer from the pest, and has therefore replaced cholam in many villages. Leaflets were also

prepared on the cocoanut beetles, the tobacco caterpillar and the rice hispa. These are illustrated, when possible, to show the pest itself and the remedial methods recommended. These leaflets serve the purpose of dissipating the cultivator's crude ideas as to the real cause of injury done to his crops, but remedial or preventive measures will only be undertaken by a few exceptionally intelligent individuals until we have our own Provincial Entomologist to organize practical field work on an adequate scale.

4. *Sericulture.*—Four broods of Eri silk worms were raised at Coimbatore and an Eri expert obtained from Pusa to teach the local men the rearing of the broods and the spinning of the silk Experiments are now in progress on a larger scale, from which it should be possible to determine if there is enough money in the industry to tempt people to take it up. The prospects of extending the mulberry silk worm industry are also being investigated. At present this is only carried on in Kollegal, where it is a fairly thriving industry. The heat of the plains has hitherto always proved too much for the worms, but it is possible that success may be met with in the cooler climates of some of our plateaus and hill stations. A few mulberry trees have also been planted in the Botanic garden at Coimbatore, and a brood will be raised there in the cold weather.

B.—Mycology.

5. Mr. McRae's apparatus has begun to arrive, and his library is expected shortly. The laboratory, however, is still unfitted, and till this is finished practically no research work can be undertaken. Mr. McRae has, therefore, spent most of his time on the palmyra disease and in tours to familiarize himself with the agricultural conditions of the Presidency. He has, however, paid a visit to the Nilgiris, the result of which was reported to Government in my letter of 23rd June 1910. The chief potato diseases found were ring disease and scab of the tubers and early blight of the leaves and stems. A leaflet has been published giving brief instructions for the cultivation of potatoes and describing the appearance of the common diseases of the crop, and the remedial and preventive measures which should be taken to guard against them.

6. Smut on cholam causes a good deal of loss every year. Three smuts are under investigation. The efficacy of a copper sulphate steep for the seed having been proved, this will be demonstrated on a field scale in the Kurnool district in the current year. Smut on paddy, though less severe, is important in view of the large area under paddy. This is also being investigated.

7. An outbreak of the Koleroga of areca palms having been reported from South Canara, Mr. McRae visited the tract with me in September. We found, however, that, owing to the long break in the monsoon, there was practically no disease this year. The people are in the habit of tying protective coverings over the bunches of nuts, and, though this method is very imperfect, it seems to suffice, as the disease is of minor importance at present in South Canara. It is worse in South Malabar. Experiments with spraying will be tried on a small scale there this year. Dr. Coleman has got very good results from spraying in Mysore, where the disease is more serious.

8. *Palmyra disease.*—The continuance of the operations to the end of the year under report was sanctioned in G.O., No. 1726, dated 22nd May 1910. Owing to the extension of the work to the Kistna district, two special Tahsildars were appointed to supervise the work in place of one special Deputy Collector for the two districts. The operations consist of cutting off and burning the heads of the deceased palms.

In January I submitted Mr. McRae's report on the progress of the operations. In spite of the greater activity of the staff, the number of trees cut showed a decrease of 30 per cent. from the numbers cut in 1909. The disease, moreover, is losing its virulence and there are signs that it is being brought under control. Accordingly G.O., No. 979, Revenue, dated 3rd April 1911, sanctioned the continuance of the operations to 31st March 1912. The fact has, however, been brought out that the fungus may remain dormant in the tree for at least ten months and probably longer. This explains the continual reappearance of the disease in localities where all the trees visibly affected have been cut out. This makes it necessary to continue the operations for a far longer period than was anticipated at first. Mr. McRae's main object

was to find out how the disease is spread from tree to tree. His inoculation experiments were very successful, and showed that infection can easily be spread by the tapper's knife. Further experiments will be made in the current year to see if insects can carry the disease from tree to tree. Everything points so far to the probability of human agency being the most important factor in the propagation of the disease.

One of the first requisites for research and teaching is a herbarium of the parasitic fungi of the Presidency. Some specimens were obtained from the Pusa collections, and the additional staff sanctioned in G.O., No. 1225, Revenue, dated 27th April 1911, will enable more rapid progress to be made in the collection of specimens.

9. A short course of Mycology was given to the students of the second year.

10. Some pepper vines were brought to Coimbatore, with a view to obtaining a culture of the pepper fungus, but these succumbed to the unfavourable climatic conditions. It is understood that the tract in the Wynaad where the disease was worst is now being put into tea, so that the matter is of less practical importance than before.

The Imperial Economic Botanist paid a short visit to Samalkota in December to see Mr. Barry's tobacco experiments. As the first sown crops had been destroyed by heavy rains, he was unable to visit the lankas.

C.—Seed and other products supplied to and received from other provinces and abroad.

11. The two new Barbados canes Nos. B. 3412 and B 6450 grew vigorously and have been planted out on a larger scale this year. Fiji B, one of the two canes imported last year, and planted at Taliparamba, has turned out to be a very high class cane. Setts have been planted on several of the other farms in the current year. The other is less promising, and having a very soft rind would suffer severely from the attacks of jackals and boring insects. Some of the Burma orange plants imported last year having arrived in a very bad condition, and died after planting, a fresh consignment was obtained and distributed. Among other new importations the American "Iron" and "New Era" cowpea both promise to be useful crops. The new maizes and cumbus continue to do well.

12. *Supplied to other countries.*—Selections of Madras sugar-canes were sent to the Punjab this year and the Central Provinces last year. The latter are reported to have done very well. Some Tinnevelly cotton seed was sent to the Phillippines, and a selection of melon seeds to Western Australia. Seed of Red Gogu (Bimilipatam jute) was supplied to the Fibre Expert, Eastern Bengal and Assam.

III.—SCIENTIFIC AND LOCAL ENQUIRY UNDER PROVINCIAL DIRECTION.

A.—Buildings and laying out of farms.

13. The construction of a dairy at the Agricultural College was sanctioned in G.O., No. 822 W., dated 3rd August 1910, at a cost of Rs. 11,000 and the Mycologist's bungalow in G.O., No. 67 W., dated 21st January 1911, at a cost of Rs. 16,990. G.O., No. 1088 W., dated 17th October 1910, sanctioned Rs. 4,500 for additions and alterations to the fittings in the Mycological laboratory, and G.O., No. 641 W., dated 16th June 1910, Rs. 21,050 for furniture for and alterations to other parts of the College. A portion of the water-supply scheme was sanctioned in G.O., No. 362 W., dated 16th April 1910, at an estimated cost of Rs. 24,900 and ornamental book cases for the Library at a cost of Rs. 8,000.

It is a matter for regret that none of these works have been finished up to the time of writing. The pot culture house sanctioned in August 1909 is still incomplete. Plans and estimates for the remaining portion of the water-supply scheme and for an installation of vacuum and pressure pumps for the Chemical laboratory were submitted to Government in Board's Reference No. 218, dated 26th January 1911. Orders have not yet been received on them. The lease of 20 cents of land in the Central farm to the Urban Bank and Stores, Limited, for the construction of a branch stores, was sanctioned in G.O., No. 855, dated 24th March 1911. More land

being required for building quarters for the subordinate staff the acquisition of 9·56 acres of land was sanctioned in G.O., R.D. No. 1024, dated 7th April 1911. The scarcity of water is a hindrance to tree planting, but this is being pressed on as fast as possible. The avenue on the Lawley road already looks well. The Botanic garden has been very skilfully laid out by the Government Botanist. Plants and seeds are freely distributed from it to the staff and students who compete with each other in gardening and beautifying the exteriors of their houses. Almost every house and hostel has a garden of some sort, the general effect of which goes far to mitigate the raw appearance of rows of new buildings.

14. No new farms have been opened during the year, and no important new works executed on the existing farms.

B.—Crops.

15. *Agricultural stations—Sugar-cane introduction.*—The Red Mauritius cane continues to make rapid progress in South Arcot. The Ashy Mauritius and Barbados 208 are also doing very well here, especially on dry land. The East India Distillery Factory encourages the cultivation of sugar-cane by supplying tops for planting free of cost. The result of this year was that the demand for tops for planting was greater than could be supplied even from the large area under cultivation, and over 2,000 acres have been planted. As in Gódávari the local canes have practically disappeared, no less than 96·2 per cent. of the area under cane in South Arcot last year being Red Mauritius cane. From experience gained in South Arcot it may now be stated confidently that, with the superior canes now available, and good cultivation and management, India can produce refined sugar at a price capable of competing with Java sugar. Large areas of suitable land, with an ample supply of sub-soil water, being available, we may expect to see South Arcot become the leading centre of the sugar-industry in Southern India. The following figures show the progresss made in the vicinity of Nellikuppam:—

	ACRES.
1907 (Red Mauritius canes sent from Melrosapuram)	...
1908	145
1909	409
1910	876
1911	2,250

16. On the West Coast, starting from an area of 5 cents of Red Mauritius cane planted on the Taliparamba farm in 1907, the area under Red Mauritius cane has increased to 21 acres, 15 of which are in South Canara. Most of this is made up of small experimental plots of only a few cents in extent, cultivated by people who are trying the crop for the first time. I visited many of the experimental plots last year, and found that everywhere the new canes had done much better than the local canes, which they will supersede here as elsewhere for jaggery making in a very short time. In Malabar, sugar-cane cultivation is a new introduction, but it has made a good start and should now spread rapidly. This will greatly benefit the district, as, apart from the large profits of sugar-cane cultivation, the introduction of this crop compels the people to pay more attention to manuring their wet lands, to the benefit of the succeeding paddy crops.

17. *Experiments with sugar-cane.*—Further experience at Samalkota, Palur, Coimbatore and Taliparamba with this crop confirms the opinion already formed that want of attention to drainage is the greatest defect in the ryot's methods of cultivating sugar-cane. The same point was demonstrated on a large scale by Mr. Neilson at Nellikuppam. It is interesting to note that the Hospet cane-cultivators, whose crops are the best in the Presidency, fully realize this, and drain their fields well. In large paddy flats it is difficult to secure good drainage, and cultivators are slow to grasp the need for it. An excellent article on the subject was contributed by Mr. Hilson to the *Agricultural Calendar*. A number of ryots near the Samalkota farm were persuaded to plant their crop in rows this year, after the farm practice, but it is more difficult to induce them to drain their lands.

18. *Ground-nut introduction.*—The progress made with this crop in South Canara is disappointing. The people are very skilful wet land cultivators, but almost entirely ignorant of dry cultivation, and cannot realize the necessity of rotation. Hence they sow the crop on the same land year after year till it fails,

when they give it up in disgust. The fact seems to be that though the crop grows very well, they at present prefer to spend their labour and manure on their wet lands. The want of a ready local market for the produce has also proved a formidable difficulty. Practically all the available wet land being already fully cultivated, the slowly increasing pressure of population on the land must compel the people of the West Coast to pay more attention to their dry lands, when they will find the value of ground-nut as a rotation crop. This fact gives importance to the experiments on the dry lands at Taliparamba which have shown that, with a rotation including crops like ginger, ground-nut and chillies, dry land can be kept under continuous cultivation with a good profit. Ginger, first introduced, on the Taliparamba farm, has become very popular in N. Malabar. At present the dry lands are only cultivated occasionally, and allowed to lie fallow for several years afterwards.

19. *Ground-nut experiments.*—The abnormal rains of October spoilt the varietal experiments on the monsoon crop. The rotation experiments, designed to find out the best crop to grow with ground-nuts, confirm the former results and show that a mixture of ground-nut with cumbu or tenai (*Pennisetum typhoideum*) or (*setaria italica*) is more profitable than a crop of ground-nuts alone. An occasional change of the cereal also seems beneficial. At Taliparamba an application of two cwts. of Superphosphate per acre showed a net profit of Rs. 14 per acre. Where wood ashes are available in quantity this is the best manure on the West Coast.

20. *Cotton—(a) Improvement of seed and seed distribution.*—The year's working has afforded most encouraging proof of the soundness of the lines on which this work is being conducted. In Kurnool the white seeded Tellapatti and in Tinnevelly the Karunganni variety have been taken up for cultivation on a large scale, as they have been proved to be more profitable as well as better than the local mixtures. In Kurnool 3,000 lbs. of seed were sold in 1909, 18,700 lbs. last year, while during the current season about 50,000 lbs. of seed, sufficient to sow about 3,500 acres, will be available and it is reported that there will be a keen demand for this. Conservative and backward as the Kurnool cultivators are, they fully appreciate the value of our seed. This work will be expanded as rapidly as possible, so as to produce annually an amount of seed sufficient to influence the whole cotton crop of the district. In Tinnevelly 119,600 lbs. of seed sufficient to sow over 14,000 acres, were sold at 43 depôts. It is found that the cultivators realise that they get better crops from Karunganni and therefore keep seed for next year from their own crops. The tracts where seed depôts were first opened have, therefore, become pure Karunganni tracts, and the depôts are now being opened in new places each year. Striking testimony has been obtained from three of the largest export Firms to the improvement in the general crop effected by these measures. In two cases new ginning factories have been opened in tracts where Karunganni has been established, on account of the good quality of the cotton obtainable there. One Firm writes, " there has been a marked improvement in the quality of Tinnevelly cotton during the last few years, especially in the Tuticorin Circle". This is one of the tracts which have been converted into pure Karunganni tracts by our seed distribution of the last three years.

Another Firm says, " We have, during the last few years, noticed that a relatively very good cotton is received from places near Koilpatti . . . . We have no hesitation in concluding that your experiment has been highly satisfactory in its results. . . . This pure Karunganni cotton to all intents and purposes is the best we can wish for ".

These operations were conducted at a total net cost to Government of Rs. 5,040–4–10 during the year. The sale of the lint constitutes the greater part of our receipts, so that the cost of the operations depends on the course of the cotton markets. Prices were very high during the year.

21. *Cotton improvement.*—The lines on which this work is proceeding were described in paragraph 22 of my last year's report. These remain unchanged, and time will be required before any definite results can be shown. For the details of the work reference must be made to the scientific reports of the farms. It will be seen from these that many good selections are under trial, and in some cases these retain their good ginning percentage from year to year. An excellent report was received from the Imperial Cotton Specialist on four of the Koilpatti selections.

22. *Cultivation.*—In the previous year 2,100 acres were sown with the drill but I pointed out last year the great difficulty of introducing an entirely new system of cultivation. This has been exemplified by the check which drilling has received this year. No rain was received till the middle of November, and many ryots who had arranged to drill their cotton were afraid to wait any longer and sowed their seed broadcast in the dry soil. When the rains came, 1,637 acres were drilled in a week. Though the drilled crops were sown very late in the season, and about a fortnight later than the broadcasted crops, they fared much better in the end, and this demonstration of the superiority of the drilling method, even in adverse circumstances, should encourage many more to try it this year. In several villages round the Koilpatti farm drilling is firmly established, and there is little likelihood of the people going back to their old system. Seventy acres of cumbu were also sown with the drill this year. In Kurnool a few more large ploughs were sold. What is wanted in the Ceded districts is not so much new implements, as more energy and intelligence on the part of the cultivators in the use of the excellent indigenous implements which they have already. None the less, the large iron plough will spread to the Nandyal valley in course of time, as the full benefit of deep ploughing is not realized in the first year.

23. *Cambodia cotton.*—Cambodia cotton promises to fully realize the hopes expressed in my last year's report. The current year's crop was estimated at 33,000 bales. It is being advertized as much as possible by the department and a large stock of seed is held for supply to those who wish to try it. It is interesting to note that the Madras mills are now making a much finer quality of cloth than before from Cambodia cotton.

There is a keen demand for Cambodia both here and in England. Its value will be best seen from prices quoted in Madras on June 20th—

	In Madras.	In Liverpool per lb.
Cambodia	Rs. 228 per candy of 500 lbs.	7·62*d.*
Northerns	Rs. 190 per candy (=6·08*d.*)	...
Tinnevellies ...	Rs. 207 per candy (Tuticorin) (=6·62 per lb.)	7·06*d.*
American cotton		7·79*d.*

From this it will be seen that Cambodia is worth more than the best Madras cottons and almost as much as American cotton. This is interesting, in view of complaints made in other parts of India that there is no market in India for superior cottons. This is not the case here.

The cotton is now being grown in Tinnevelly, Ramnad, Madura, Coimbatore, Trichinopoly and South Arcot. Efforts are being made to extend it to the western taluks of Bellary where Dharwar American cotton, a similar type of plant, though inferior to Cambodia, has made great strides in the last few years.

At present it shows no signs of deterioration, and as the yield per acre is four to five times that of the indigenous cottons, yielding a profit of Rs. 150 and more per acre, it will soon be found in every part of the country and should effect a revolution in the local cotton industry. It is grown on garden lands with well irrigation, and in some cases on wet lands. It does not, therefore, displace the indigenous cottons to any appreciable extent, being grown on a different class of land. The Government Botanist is conducting experiments on scientific lines at Coimbatore to see if it can be improved by crossing with Bourbon. A severe attack of stem borer spoilt this year's experiments, but the Government Botanist considers that the habit of the plant and the shape and size of the bolls are proved to be Mendelian factors, and that useful characters have been combined in at least two plants. This work has very great possibilities as each variety has useful characters peculiar to itself. Could these be combined, a variety superior to Cambodia would be the result. The marvellous spread of Cambodia illustrates the immense value to the country of a good new variety of cotton.

24. *Paddy experiments—Varieties.*—At Palur a variety from the Central Provinces called Rascadam shows signs of being a useful early season paddy It is of better quality than the Madras early paddies. Seed is being distributed this year. Several other new varieties are improving as they become acclimatized. Banku has given good yields at Samalkota, but it still tends to split

up into different forms, and requires constant selection to keep it up to the best type. The effect of changed climatic conditions on imported varieties is always very noticeable at Coimbatore, where many different kinds of paddy are grown for instructional purposes. Enquiries are often received for a variety of paddy suited to swampy lands. Experiments conducted for several years at Samalkota show that Kalabhaira, an imported paddy, thrives fairly well under swampy conditions, though of course like all swamp paddies it produces inferior rice.

25. *Planting methods.*—Mr. Hilson's Samalkota report brings out clearly the fact that, without actual measurement of the distances between plant and plant, spacing experiments are never accurately carried out. Hence too much importance cannot be attached to the results of the field plots comparing different spacings. Inspection of the crops on the ground, however, always reveals the fact that singly planted fields have a greener appearance and show more vigorous growth than fields planted in the usual way. Watching these experiments for several years, it is noticeable that as soon as the whole non-experimental area of a farm is planted with single seedlings raised in thinly sown seed beds a striking improvement is seen in the whole crop. At Coimbatore this year the average yield for the whole area of wet land on the farm was 3,000 lbs. of paddy per acre, a very good yield, while the average yield for the district may be put at 2,000 lbs. A special effort was made last year to popularize single planting in Tanjore. Three subordinates were sent on lecturing tours, and large numbers of Tamil leaflets were distributed. A large area roughly estimated at 7,000 acres, was planted in this way last season and many more landowners, while they are afraid to adopt the system at once, are reducing their seed-rate and sowing their seed-beds more thinly. This brings home to them the wastefulness of their present seed-rate, and by degrees they will adopt the single planting system. I and Mr. Sampson visited many of these experimental plots and we found them all successful, most of them promising to yield far larger crops than the surrounding fields. I am informed from independent sources that there is hardly a village in the delta without its experimental plot of singly planted paddy.

A saving of about Rs. 3 an acre in seed alone can be effected by single-planting, and better crops realized. This is now so well known, that the only objection to the system which Mr. Sampson and I met with on our tour was that the land was exhausted by single-planting. This is the best proof that the crops are larger. These efforts are being continued in the current year in Tanjore, and in the neighbourhood of all the Government farms.

26. *Manuring and concentrated manures.*—The pati-mannu experiments in Kistna confirmed the view formed before, that, in most cases, potash is not required on paddy lands, while superphosphate gives a good profit. Wide-spread interest has been aroused in the subject of concentrated fertilizers by the demonstration plots, and leaflets circulated on the subject, and the Presidency manure works are taking advantage of this by opening depots in the Kistna for the supply of the artificial manures recommended by the department.

The experiments at Samalkota and Coimbatore also show the value of superphosphate for paddy. Two cwts. per acre at a cost of about Rs. 8 give a considerable increase in the crop and yield a substantial net profit. Plain bone-dust has also given good results at Coimbatore. In view of the rapidly developing fish oil industry on the West Coast, the high yields of paddy at Coimbatore manured with fish manure are important, as the fish guano left after extraction of the oil is, if anything, a better manure than the whole fish. It is also a good manure for garden crops.

27. *Green manuring crops.*— A comparison of tables VI, VII and VIII in Mr. Wood's Coimbatore report reveals the fact that no manure applied in quantities which it is possible to use in ordinary practice, equals the effect of green manures grown on the land and ploughed in. *Sesbania Aculeata* (Dhaincha) yielded 12 tons of green manure per acre at Palur and 13½ tons at Coimbatore. This amount could not, of course, be applied to the field in which it grew, but part of the green stuff was cut and carried to adjacent fields. The plots in which *Sesbania* was grown yielded no less than 4,435 lbs. and 4,200 lbs. of paddy respectively. Great success has been attained in the current year with wild indigo. The hard outer coat of the seed hinders germination and only a small percentage of the seed sown comes up in the first year. By slightly abrading this coat by treading it in sand with bullocks,

or by other mechanical means, excellent crops of this valuable green-manure have been raised. The cost of growing a green manure crop varies from Rs. 1–8–0 to Rs. 5 per acre, while an equal application of green leaves brought from outside would in practice be prohibitive in cost, and impossible to procure for large areas. The much smaller amounts actually used by the cultivators are estimated to cost from Rs. 10 to Rs. 25 per acre. To popularize the practice of growing green manures among the cultivators, stocks of sunn-hemp, indigo, wild-indigo, *Sesbania aculeata* and other leguminous plants were laid in, and 77,150 lbs. of seed were sold without difficulty to the public. This is sufficient to sow 6,210 acres. Most of this was sold in the Tanjore and South Arcot districts but a beginning is being made this year in Madura, where there is a great need for leaf manure.

During the last three years the hot weather showers in these districts have been an almost entire failure. In spite of this, many people already realize the value of green manuring, and there is a ready sale for all our seed of green manuring crops. It is interesting to note that both single-planting of paddy and green manuring have long been practised in specially intelligent localities, but are unknown to the mass of the people. By demonstration and advertisement and the supply of seed of green manuring crops, it is hoped to extend them in time to every district in the Presidency. No other improvements at present advocated by the department are so certain of success, or hold out the same immediate inducements to the cultivator to take them up.

28. *Second-crop experiment in Gódávari.*—To avoid the waste of water which occurs now in the interval of two months which occurs between the harvesting of the first crop and the planting of the second, an attempt is being made to find a variety of paddy which can be sown in November or December. Yerrabakkalu, a Nandyal variety, gave some promise this year and will be tried on a large scale next year Of the local varieties Garika sannavari is still the best, though not so good as it is when sown later.

29. *Miscellaneous crops.*—At Koilpatti the ridge and furrow system in the monsoon season again gave better crops. This is being taken up slowly by the cultivators. Success has been achieved with the South Arcot onions introduced here. In South Arcot the bulbs for planting are raised from seed, and a better crop is realized in the way than when bulbs from a bulb crop are planted. An attempt is being made, with prospects of success, to introduce this practice. Seed is being imported for sale.

A promising experiment was tried at Coimbatore of growing green manures on garden land, and ploughing them in as a manure for the succeeding crop. It is found that the green stuff readily decays after irrigation. If further experience confirms the utility of the practice it should give an impetus to garden cultivation, which requires heavy manuring with bulky organic manures to keep the land in a fertile condition.

30. *Seed distribution.*—The success of the distribution of cotton seed encourages us to hope for equal success with other crops. A beginning is always made from a single plant selected in the field, and it is surprising how quickly a large stock can be worked up from a single plant. In 1910 a single plant of paddy was selected at Coimbatore. Its produce will suffice to sow 30 acres in the coming season. Some promising strains of cholam have been worked up in the same way at Hagari. The raising of pedigree strains of seed of all the crops, the testing of them by careful field experiments, and growing the approved strains on a large scale for sale to the cultivators will assume a more and more important place in the work of the department as time goes on. This is work which the ryót is incapable of doing for himself. It requires trained judgment, time, money and the most minute attention to details, besides a thorough knowledge of the crop. It has the further advantage that there is never any difficulty in getting the cultivators to buy good seed. The adoption of good seed involves no extra expense, and no change in their cultivation methods. On all the farms selections are made every year from the chief crops and in time improved strains of all the crops should be available. Special attention is paid to teaching the subject to the students, as seed selection must be carried out in each local area for the locally grown crops.

31. *Ponnalur tank.*—In G.O., No. 1368, Revenue, dated 26th April 1910, it was directed that the experiment of growing irrigated dry crops under the Ponnalur tank should be given up. In future no restriction is to be imposed as to the nature of the crop to be grown under the tank, water-rate being levied according to the crop grown. A return received from the Collector shows that in fasli 1320, 174·63 acres of first crop and 11 acres of second crop were under paddy compared with 57 acres in fasli 1319. The only dry crop cultivated on a large area was ragi on 153 acres. As the salt is washed out of the soil, more land is likely to be put under paddy.

32. *Hindupur Agave plantation.*—In G.O., No. 965, Revenue, dated 3rd April 1911, my proposal to give up the Hindupur agave plantation was approved. Some figures regarding the growth of the plants and the average production of leaf and fibre per acre have been obtained, but the cost of extraction of the fibre by hand is prohibitive. The only chance of success for the industry seems to lie in the invention of a small portable fibre machine suitable for use by unskilled labour. I cannot hear of any suitable machine. The great fluctuations in the fibre market, moreover, are unfavourable to the investment of capital in the industry.

33. *Pepper.*—The vines continue to improve with good cultivation. The most important piece of definite information gained in the year is that lime and leaf mould gives the best results of any of the manures tried. Fish manure is also very good. After a heavy crop such as the vines bore last year, it is a common thing for many to die out. Very few deaths, however, have occurred. This shows the effect of good cultivation.

34. *Tobacco experiments.*—One hundred and fifty acres were planted with exotic tobaccoes by Mr. Barry. The lankas were inspected by Mr. Hilson in March. The season was very unfavourable, the early seed-beds being destroyed time after time by heavy rains. The latter part of the monsoon was a complete failure. In spite of this, good crops were obtained on part of the land. The most interesting feature of the year's work was the success of the plots green manured with sunn-hemp and wild indigo. I have asked Mr. Barry to furnish me with more information about the curing and marketing of the crops of previous years, but this has not been received up to the time of writing.

35. *Visitors to farms.*—The Collectors of Malabar, South Canara, Tinnevelly, Ramnad, Madura, South Arcot, Kurnool and Gódávari were asked to instruct some of their Tahsildars to visit the farms in or near their districts at suitable times, taking with them a few of the best cultivators of their taluks. These visits were very successful, especially in Malabar, where the visitors attended in large numbers and showed great interest in the Taliparamba farm. On all the farms a fair number of visitors are received. The farm staff all make frequent visits to the surrounding country to talk to the people about the improvements introduced on the farms, and invite them to pay the farm a visit.

36. *Implements.*—The implements referred to in last year's report, viz., the Archimedian screw water-lift, the Scinde plough and the triangular harrow are increasing in popularity.

Eighty-one implements were made to order at Palur. The manufacture of the Archimedian screw lift has been taken up by local firms in Tanjore and Trichinopoly. It is a most effective instrument for lifting large quantities of water up to a maximum height of four feet. It can, therefore, be used to remove the excess of water from low-lying paddy fields during the rainy season, a common cause of damage to the crop in Tanjore. Messrs. Burn & Co. and Messrs. Massey & Co., both turn out a light iron plough which does good work on loamy soils. Efforts have been made to popularize these and a fair number have been sold. Wooden ploughs wear out fast, and in many places it is becoming difficult to get wood at a reasonable price. Sugarcane mills are being introduced into Malabar and South Canara.

A great want is a really cheap and effective winnower. The grain is easily threshed by cattle power but winnowing is often a tedious process when there is no wind. Several firms have had their attention directed to the subject. The English digging fork is in common use among potato growers in the Nilgiris. It is more efficient than the mamutty for digging up root-crops, such as sweet potatoes, turmeric, etc., and efforts are being made to introduce it at Samalkota.

37. *Publications.*—Only one bulletin was issued during the year, No. 62, by Mr. Lonsdale, Agricultural Expert to the Court of Wards on the Home Farm, Sivagiri. Short leaflets in the vernaculars, illustrated where necessary, are found more useful, as they are more likely to reach the cultivators.

During the year under report the following leaflets were issued:—

(1) Groundnut cultivation in the West Coast (Leaflet No. II of 1910).
(2) Method of preparing preserved ginger (Leaflet No. III of 1910).
(3) Hairy caterpillars (Leaflet No. VI of 1910).
(4) Swarming caterpillar pest (Leaflet No. VII of 1910).
(5) Conservation of cattle urine (Leaflet No. VIII of 1910).
(6) Experiences of single seedling planting of paddy (Leaflet No. IX of 1910).
(7) Useful facts learnt from experimental cultivation at the Palur agricultural station (Leaflet No. X of 1910).
(8) Useful facts learnt from experimental cultivation at the Taliparamba agricultural station (Leaflet No. XI of 1910).
(9) Light traps (Leaflet No. XII of 1910).
(10) Individual manuring of paddy (Leaflet No. XIII of 1910).
(11) Useful facts learnt from experimental cultivation at the Central Farm (Leaflet No. XIV of 1910).
(12) Useful facts learnt from experimental cultivation at the Koilpatti agricultural station (Leaflet No. XV of 1910).

They are distributed partly to visitors to the farms, and partly by the farm staff during their tours. Sometimes they are sent to Collectors of districts for distribution through village officers. Notes on subjects of interest are communicated to the English and Vernacular Press from time to time. Judging from the number of enquiries received, some of these have succeeded in attracting public attention.

In G.O., No. 1780, Revenue, dated 31st May 1910, the agricultural calendar was ordered to be printed in all the vernaculars of the Presidency, and supplied free to all village officers. A copy is also sent free to each elementary school. Each year the opinion of District officers and Educational authorities is invited on the form and contents of the calendar. Many useful suggestions have been received, and as a result of this independent criticism, the calendar was issued in a more handy form this year. The frontispiece is an excellent illustration of the Agricultural College, the work of the Principal, Mr. R. Cecil Wood. Apart from the free distribution, a fair number of copies have been sold to the public, and enquiries, evidently prompted by a perusal of the calendar, are being received in large numbers. There can be no doubt that it serves its purpose of bringing the work of the department to the notice of the cultivators, and advertizing the new crops, methods and implements. Great care is taken to make the articles simple and practical.

As directed in G.O., No. 2493, dated 29th July 1910, short summaries of the useful information contained in the scientific reports of the agricultural stations were prepared and issued in English and Vernacular.

C.—Agricultural Exhibitions and Cattle Shows.

38. Agricultural exhibitions and cattle shows were held at Madura, Tirupur, Berhampur, Pithapuram, Ellore, Kottavalasa, Ongole and Kottacheruvu during the year.

After careful consideration I am of opinion that the conclusions arrived at by the Agricultural Committee of 1889 still hold good, and that in the absence of the conditions which make these shows a success in England, they are of no practical value. No improvement in the cattle of any tract has ever been observed in consequence of these shows. I have submitted a separate report on this subject, and the matter is still under consideration.

Agricultural associations.—As stated in last year's report, all Collectors were consulted as to the utility of these associations. Their replies showed a consensus of opinion that the associations were moribund, and had never done any real work. I have submitted a full report on the subject separately. The associations have been mainly composed of amateurs, and the few ryots who were induced to join them have never shown any effective interest in them. The formation of these associations was premature. Official pressure can never make them a living reality. In order that they may succeed, there must not only be a practical scheme for securing material advantages by combination, but the leading spirits in the associations should be enthusiasts in the cause.

IV.—BOTANY.

39. The report of the Government Botanist is attached to this report, and has already been submitted to the Board. I will, therefore, only allude briefly to one or two points here. Most of the time of the Government Botanist was occupied with teaching. The work on cotton, referred to in paragraph 23 above, was delegated to the Botanical Assistant M.R.Ry. T. S. Venkataraman, who has shown great aptitude for the work. An important fact brought out by the Government Botanist's analysis of samples of cotton seeds received from different parts of the Presidency is that the seed ordinarily available to the ryot is a mixture, containing several varieties of varying utility. This explains the invariable success of the distribution of pure seed. It is probable that the same is true of other crops, all of which contain if not always separate varieties, still, a number of strains of varying quality and productiveness. The separation out of the best strains and propagation of them for seed supply thus offers a wide field of usefulness for the department.

The work on Hibiscus Cannabinus and Mirabilis has served its purpose of training the Economic Assistant in Mendelian work, the fruits of which we hope to realize in an improved variety of cotton, and other crops later on.

The botanic garden is a brilliant illustration of what can be done to beautify the most unpromising surroundings. This excellent object lesson has stimulated the interest of the students in Horticulture, and it is hoped that most of them will take away with them from the College a genuine interest in gardening.

V.—CHEMISTRY.

40. The feature of the work of the Agricultural Chemist for the year has been the great increase in soil samples sent in for analysis by private individuals and in letters from cultivators asking for advice. By his work on the gases evolved from land occupied by the paddy crop Mr. Harrison has opened up a field of enquiry into the method in which the paddy plant obtains its food, which is of the first importance. This is being pursued as time permits. Regarding the pati-mannu experiments Mr. Harrison writes that "the experimental and demonstration plots have, on the whole, yielded such encouraging results that ultimate success appears certain". The primary object of these experiments was to find a substitute for the pati-mannu. They have, however, resulted in the collection of useful information about the manuring of paddy in general. I have asked Mr. Harrison to embody this in a Bulletin which will be issued shortly.

VI.—AGRICULTURAL EDUCATION.

41. The maximum number of students provided for is 60, 20 of whom are admitted each year for the three-year course. The first batch of students admitted in 1908 finished their course at the end of the year under report and were examined for their diploma in Agriculture by Mr. D. Clouston, Deputy Director of Agriculture, Central Provinces. Fourteen students out of the sixteen who appeared for the examination obtained the diploma. The report of the Examiner, which has been submitted to Government, was a very gratifying testimony to the thoroughness of the teaching at the College. The students were reported to have a wide and accurate knowledge of agriculture, and the benefit derived from the thorough training in field work which all the students obtain on the farm was apparent in the Examiner's report. I have no doubt that the students whom the College is now turning out are thoroughly qualified to set about the improvement of the agriculture of their own districts. About half of them are the sons of landowners, whose object in coming to the College is to acquire a knowledge of practical farming which will enable them to manage their own properties to better advantage than before. Only a few men will be required to fill vacancies in the department each year. It is, therefore, important to maintain a high proportion of students of the landowning classes who do not require Government appointments. It is to be noted that in another Province where a much larger number of students is turned out annually, most of them belonging to the literary classes, the difficulty of providing the passed students with employment is already acutely felt, and the demand is being put forward that preference should be given to agricultural diplomates for appointment in other departments. From the experience gained at the Saidapet College it is certain that an Agricultural College which is degraded into a training

school for Government officials in the Revenue Department soon ceases to attract the best class of students, men connected with the land. The teaching also loses touch with practical agriculture, because the real aim of the students is to pass an examination qualifying themselves for employment, and not, as it should be, to gain a practical working knowledge of agriculture which they can use for the improvement of their estates. The examination of the second year students in science was conducted by Mr. Warth, the Burma Agricultural Chemist, and Mr. Southern, Acting Deputy Director of Agriculture, Southern Division, with the help of the College staff. The results were very satisfactory, as all the students passed. The third year students made two tours, one in the Tamil country and one in the Telugu. Perhaps the chief value of a scientific training in agriculture is the insight it should give into the principles underlying diverse agricultural practices. Our students would be imperfectly trained if they merely learnt the methods of growing crops practised at Coimbatore. The value of these tours therefore, lies in the opportunities they afford to the students of seeing new applications of the fundamental principles they have learnt at the College. This fixes the principles themselves in their minds and teaches them to understand and respect the well-tested methods worked out by the ryots. A thorough understanding of an existing system of cultivation is necessary before any attempt can be made to improve it. The students made good use of their tours, and Mr. Clouston, the external examiner in agriculture, specially remarked on the wide knowledge of agriculture they had gained during these tours. The students are examined individually twice a year by the Deputy Directors of Agriculture on their field work. This has a stimulating effect on the students and useful practical suggestions are often made by the Deputy Directors for the improvement of the practical training.

42. It was originally intended that each of the ten hostels, accommodating six students in each, should form a separate mess, and each hostel was accordingly provided with a separate kitchen and dining room of its own. In practice it is found that the students have not time to do their own house-keeping, and, prefer to have their meals provided for them. A joint mess has therefore now been arranged for with two scales of food, costing Rs. 8 and Rs. 12 per mensem, respectively, to suit the different pecuniary circumstances of the students. In exceptional cases students who desire to do so will be permitted to provide their own food. A surprising improvement is always observed in the health and physique of the students, due to good food and regular work in the fields.

It is hoped to keep in touch with the old students of the College. A students' union has been formed by the students themselves. The intention is to have one or more annual reunions at the College and publish a journal occasionally on topics of common interest.

43. The above summary of the year's work shows that all the officers of the department have worked with zeal throughout the year, and that their efforts have been crowned with a great measure of success. The subordinate staff continue to improve in efficiency, as may be seen from the rapid expansion of the work in the districts, which is carried out entirely by them. Space does not permit mention of the particular pieces of good work done by each member of the department but I cannot refrain from saying that the duties of the Principal of the Agricultural College, which call for much tact, and patience and organising ability, in addition to a great deal of continuous hard work, have been discharged most successfully by Mr. Cecil Wood.

44. *Non-official visitors.*—Six visits were paid from non-official visitors during the year. Their remarks have been forwarded to the Board. As the term of office of most of them has expired, I have submitted a fresh list of names for appointment as honorary visitors.

45. *Publications.*—The number of publications received from other countries and other Provincial Departments was as follows:—

	Indian.	Foreign.
Periodicals	30	74
Bulletins	40	235
Reports	210	25

MADRAS,
26*th June* 1911.

M. E. COUCHMAN,
Director of Agriculture.

APPENDIX I.

THE ADMINISTRATION REPORTS OF THE AGRICULTURAL STATIONS DURING THE YEAR 1910–1911.

Administrative Report of the Deputy Director of Agriculture, Northern Division.

I have the honour to submit herewith the administration reports on the agricultural stations under my control with a short account of the district work connected therewith for the year 1910-1911.

2. *District work.*—This work, which has assumed much larger dimensions this year, may be conveniently divided under the four following heads:—

(1) Distribution of seed of selected strains of local cotton grown on the farms in the Ceded districts, with the introduction of the heavy iron plough in those black cotton soil tracts where its use is as yet unknown.

(2) Distribution of good varieties of sugarcane, with the introduction of improved methods of cultivation and cleaner methods of preparing jaggery.

(3) Introduction of improved methods of cultivating paddy.

(4) Distribution of seed of exotic varieties of maize and sazza; of Cambodia cotton in suitable tracts and of good seed of local crops grown on the farms.

3. *Cotton.*—The greater proportion of the work under this heading has been done at Nandyal farm, where an Assistant Farm Manager has been specially deputed to attend to the work.

Two seed farms, comprising a total area of 34·60 acres, in Koilkuntla taluk were sown down with farm seed, and a total quantity of 25,000 lb. of seed, 18,700 of which were sold from Nandyal farm and the remainder from Hagari and Bellary, were sold this year.

It is worthy of note that in the case of the Nandyal seed, the ryots are taking enough seed to sow out the whole of their cotton area for the year and in a number of cases are carefully reserving seed from this crop for the next season.

With regard to implements, owing to the lateness of the jonna and cotton harvests no demonstrations could be held this year and only two ploughs were sold.

Assistant Farm Manager M. Raghavalu Nayudu was in charge of this work at Nandyal until the 23rd November 1910 when he was transferred to Coimbatore and his place was taken by Assistant Farm Manager K. Narayana Aiyangar who continued until the end of the year.

4. *Sugarcane.*—The centre for this work is Samalkota farm. Owing to the poor growth of the canes this year on this farm and to the fact that in the delta distribution from ryot to ryot was going on, the demand for B. 208 was not great this year.

Three thousand and five hundred canes of B. 208 and 1,070 of Red Mauritius were however disposed of.

The work of distributing new varieties of cane is comparatively easy; it is however a much more difficult matter to introduce improvements in the methods of cultivation.

The two points the department lays most stress upon are planting setts in rows instead of broad-casting and deep-draining. One hundred ryots in the neighbourhood of Samalkota farm were induced to plant small areas in this manner and a total area of 118 acres was so planted. The attention given to drainage however was very slight and though in a few instances the benefit of planting in rows is apparent to the ryot he is by no means convinced of the advantages of deep draining.

Fourteen demonstrations of the improved method of making jaggery, which simply consists in straining the juice through a sieve before boiling, adding lime water to the juice to prevent inversion and removing the scum as it appears, while boiling, were held.

The ordinary ryot does not view this method with favour; the removal of the scum entails a certain decrease of the outturn of jaggery and until the standard of quality required is raised generally the progress of the introduction of this method is likely to remain slow.

Assistant Farm Manager N. Seetaramasawmy Nayudu with the exception of 3 months privilege leave was in charge of this work throughout the year.

5. *Paddy.*—The introduction of improved methods of cultivation, *i.e.*, sowing seed-beds thinly, at the rate of 1 Madras measure per cent. of bed per 5 acres of crop and transplanting seedlings singly is being advocated in the neighbourhood of all the farms save Bezwada.

Seventy-five acres were planted in this way under the advice of the farm officers, most of which was in the neighbourhood of Samalkota farm, where this system has been advocated longest.

The seedlings were in most cases planted from seed-beds too thickly sown; the advantages of the method were however still apparent and the prospects of the general adoption of this method of cultivation seem hopeful.

6. *Miscellaneous.*—Small quantities of Hickory King and Brazilian Flour corn maize were distributed from Bezwada and Samalkota farms and a quantity of about 1,000 lb. of Cambodia cotton seed were distributed in the Northern division.

Reports concerning the former are satisfactory but as regards the latter conflicting; chiefly on account of the fact that the season was somewhat unfavourable for this cotton and also that in many cases it was sown on the wrong kind of land. Applications from districts likely to be suitable are however coming in, in fair numbers and the prospects of its wider introduction in this division are fairly hopeful.

The numbers of ryots who come to see the farm and to buy seed of local crops are increasing and show that the operations of the department are viewed with less suspicion than formerly.

The Samalkota Agricultural Station.

Season.—The season was unfavourable. The hot weather rains were a failure, while the monsoon rains were excessive.

2. *Crops—Sugarcane.*—The canes were planted late and suffered severely in the hot weather, while later owing to excessive rainfall they were kept back and given no opportunity of making up the growth they had lost.

Some disease appeared in the nursery and on the farm but the amount was small, though it is still fairly prevalent in the district.

Late planting has caused them to be much later in maturing this year and no results are to hand.

The growth of the canes in the nursery was on the whole very poor; the two new canes B. 6450 and B. 3412 had however done fairly well, though the result of their analysis is not very encouraging.

Paddy.—This crop also suffered from late planting and the unfavourable season and the yields as a whole are lower than last year's.

The results of both manurial and cultural experiments are in several cases at variance with those already obtained and show that more work along these lines is required.

The results of the spacing experiments confirm the conclusion arrived at last year that close planting with doubles does not allow of enough room for development and next year the minimum spacing for doubles will be increased to 6".

Turmeric.—The crop was planted late and suffered from the heavy rainfall. The yields were in consequence poor.

Dry crops.—The dry crops grown this year were dry paddy, red gram, maize, sorghum and Cambodia cotton. All suffered from too much moisture and maize may be described as a failure.

Cambodia recovered somewhat during the cold weather and so far has given a yield of 500 lb. of kappas per acre; picking, however, is not yet over.

3. *District work—Paddy.*—Ninety-seven ryots were induced to try single planting of paddy and a total area of 69·57 acres was transplanted in this way. The opinions offered on the advantages of adopting this method were various but the outlook for its future success in this district is hopeful.

Sugarcane.—Owing to the poor growth made by the farm canes and also to the fact that distribution from ryot to ryot was going on in the district the demand for farm canes was not so great this year. 3,500 B. 208 and 1,070 Red Mauritius canes were however distributed. The latter cane is now the cane most commonly met with in the district.

One hundred and eight ryots planted canes in rows, most of them with the assistance of farm coolies, but a few, of themselves.

Fourteen demonstrations of clean methods of jaggery-making were held. The adoption of this method by the ryots is however not likely to be rapid unless the general standard of quality for jaggery is raised.

The number of visitors to the farm this year was 151.

4. *Staff.*—Assistant Farm Manager A. Peterson was in charge until the 5th of May when he was relieved by Farm Manager T. V. Rajagopalachari who remained in charge until the 15th August 1910 when charge was taken over by Farm Manager V. Muthusawmi Aiyar who continued till the end of the year. Assistant Farm Manager V. S. Narayanasawmy Aiyar was transferred to Coimbatore.

Assistant Farm Manager N. Seetaramasawmy Nayudu continued throughout except for 3 months privilege leave and Assistant Farm Manager M. Raman was deputed to attend to the district work while that Assistant Farm Manager was touring in Vizagapatam.

The Hagari Agricultural Station.

Season.—The season was somewhat unfavourable for black cotton soil crops, the rainfall being in excess of requirements adversely affected the growth of both early and late crops. The heavy rains were however most useful in promoting the growth of vegetation on the sands along the bank of Hagari.

2. *Crops—Early.*—The early crops sown were korra (*Setaria italica*), sazza (*Pennisetum typhoideum*) and sorghum. The yields, however, except in the case of the last named which was decidedly poor were in no way remarkable.

A comparative test of four types of korra, red, awned and awnless and yellow, awned and awnless, gave results in favour of the yellow awnless type.

Late.—Very little can be said concerning these, since as is stated above the season was a late one and the threshing of grain crops and picking of cotton is still in progress.

Selection work in sorghum and cotton continues to be done.

In the case of the former the results are encouraging, an interesting correlation of an external character, the colour of the midrib with an internal character of economic importance, sweetness or pithiness of fodder, having been rediscovered, which if found to be permanent will simplify this work in this crop.

The correlation of these two characters was mentioned by Benson in his Bulletin, "Sorghums in Madras Presidency," but the point seems to have been lost sight of.

The experiments with a solution of copper sulphate as a steep for jonna show that a 1 *per cent.* solution is of sufficient strength and its use will be advocated in the district.

As regards cotton, experiment so far shows that the local cotton yields about equally with the farm cotton and that their percentages are equal. The former however proves to be very much mixed and in that respect the farm cotton is much superior and may with advantage be distributed in the district.

Selection work in this crop has not gone far enough yet to enable it to be said that any one of the farm selections is superior to the others, but another year's work should make this possible. It has however shown the unsuitability of American cotton for these black cotton soil tracts and work with this variety will be given up.

3. *Garden.*—The garden has now been laid out. The soil is naturally not yet in very good condition and the results of the year's working show only a small profit.

Onions, maize, tobacco, chillies, groundnut and a small plot of Cambodia cotton were the crops grown. The first three were the only ones that did at all well, though the yield of the first named was lowered by disease and the unfavourable season.

A few canes of Red Mauritius sugarcane has been planted this year and its suitability for this district will be tested.

4. *Experimental work.*—All irrigation experiments have been abandoned as has also the cotton thinning experiments.

The results of the Magnesia-lime manurial experiment have this year been vitiated by a heavy wash which ran through the plot and adversely affected the growth of the crop.

An experiment to test the effect of sheep-penning on black cotton soil was started this year and so far the results obtained are in favour of that experiment.

5. *District work—Cotton.*—4,050 lb. of farm seed were disposed of to 47 ryots

The farm seed, as stated above, is superior to the local in that it is of a fairly uniform type, though at present not of greater yielding quality and its wider distribution in the district would be an advantage.

Paddy.—A few ryots in the villages of Chaganoor and Asunda along the Hagari were induced to try single planting and expressed themselves satisfied with the method.

A few ryots are adopting improved methods on garden cultivation, such as planting onions and ragi on ridges and it is hoped that with the farm garden in proper working order this work of improving the garden cultivation of the neighbourhood will make more rapid progress.

The number of visitors to the farm was 224.

6. *Staff.*—Farm Manager M. Mangesha Rao continued in charge until the 30th October 1910 when he was transferred to Koilpatti and Farm Manager S. Ramasawmi Pillai took his place.

Assistant Farm Manager V. S. Ramasawmi Aiyar continued until the 4th December 1910 when he went on leave.

The Bellary Agricultural Station.

Season.—The season was on the whole favourable. The early south-west monsoon rains were sufficiently heavy to enable "*mungari*" sowings being done in good time and this coupled with the good rains received during the north-east monsoon made conditions for the growth of these crops exceptionally favourable.

The heavy rains of September, however, somewhat retarded the growth of the korra-cotton and pure cotton crops; in spite of this, however, on the better portions of the farm these crops did fairly well.

2. *Crops*—(*a*) *Early.*—Owing to the favourable season reported above, heavy yields have to be recorded.

Pure korra in Field No. 2 W. yielded on the average at the exceptionally high rate of 1,084 lb. grain and 1,283 lb. straw, while mungari jonna in Fields Nos. 6 c and 7 gave an average acre yield of 1,420 lb. of grain and 8,020 lb. fodder; yields in both cases far above any previously recorded for the farm. The highest individual yield for korra was 1,825 lb. grain and 1,925 lb. fodder from plot No. 16 manured with safflower cake + supers, and for mungari jonna 2,490 lb. grain in the case of red No. 1 and 15,900 lb. fodder in the case of red No. 2.

Korra in Korrapathi was only up to the average.

(*b*) *Late.*—In growth these were only fair, the yields, however, are not to hand as harvesting is still in progress.

3. *Experimental work.*—The permanent tillage plots and the cotton thinning experiments have both been given up, and the two series of manural plots are being cropped now to test the residual effect alone of the manures applied.

Comparative plots of early sorghum varieties were again laid down. The results this year, apart from the fact that the yields are higher, differ somewhat from previous years, kagi jonna in point of fodder, being beaten by both red No. 2 and yellow No. 1. On the average of six years' yields, however, this variety shows itself to be the best, and as it seems to be a distinct acquisition to the district, steps will be taken to bring about its introduction.

Further details of these experiments are given in the scientific report.

4. *District work*—(1) *Cotton seed.*—Two thousand four hundred and ninety pounds of seed were disposed of this year, most of which was sold at the farm itself, only a small quantity being sold along with the seed from Hagari farm from the godown hired for the purpose. The total quantity of seed distributed from Bellary and Hagari together was 5,380 lb. to 58 ryots in 12 different villages.

(2) *Improvement in paddy cultivation.*—A number of ryots in Moka were induced to try single planting. Though none of the seedlings planted were grown in thinly sown seed-beds, where single planting was adopted and transplanting done in the right season, the yields were satisfactory and the prospects of the gradual spread of this improvement seem hopeful.

Six ryots tried the experiment, the total area transplanted being 72·63 cents.

(3) *Green-manure.*—A small quantity of *Sesbania* was distributed to two ryots in Moka village.

(4) *Sugarcane.*—Twenty canes each of Red Mauritius were distributed towards the end of the year to three selected ryots in Hospet.

The number of visitors to the farm this year was 203.

(5) *Staff.*—Assistant Farm Manager, W. Raghavachari, was in charge of the farm throughout the year with the exception of 1½ months when he was on privilege leave, the farm during that period being in charge of Assistant Farm Manager, V. S. Narayanasawmi Aiyar.

The Nandyal Agricultural Station.

Season.—The season this year was even less favourable than last, although the total rainfall recorded was less.

More than half the fall reported was received between the middle of August and the end of October, and this in the first place delayed the sowings of cotton and sorghum and secondly made it necessary for partial resowings to be done in both of these crops.

2. *Crops.*—The above-mentioned crops continue to occupy the main attention of the farm staff.

The yields of the former are not to hand, but taken all over the farm, the growth of the crop was poor, though the selections were somewhat better than the main crop. Compared with the crops outside, however, the farm crops were good, this being due in some cases to better seed and in others to the fact that the ryots sowed their seed mixed with horsegram, which, contrary to their expectations, grew luxuriantly to the detriment of the cotton.

As regards selection work a less satisfactory state of affairs has to be reported. In the Herbaceum selections a number of plants of the indicum type were noted and it was thought at first that merely some admixture of seed had taken place. Further examination, however,

brought to light some plants which exhibited characters of both of these species, and it was concluded that crossing had occurred. A number of these plants were marked and the produce of these will be collected separately and sown out next year and the behaviour of the resulting plants noted.

The yields of sorghum owing to the bad season are only moderate. The selections sown out this year were completely spoiled and a fresh start will have to be made.

3. *Experimental work.*—Comparative tests of the five sorghum varieties, cheruku patcha, red No. 1, venna mudda, vanka and nilwa were again made this year. Cherukupatcha once more proved its superiority and it is evident that of these varieties this is the most suitable for the district. The others will therefore be discarded and further work with this crop will be confined to the improvement of this variety by selection.

The indigo rotation experiment was continued. Except that the crop was the best grown since the laying down of this experiment, there is, however, nothing further to report.

Manurial plots were laid down to test the effect on sorghum of an application of bone-char-super and sheep-folding. The results obtained only emphasise the fact that the season has been a bad one, and do not give any information.

4. *District work.*—(1) *Cotton.*—The work of distributing farm cotton seed is becoming increasingly important. The ryot of this district has now been convinced that in buying farm seed he is obtaining a better article than he would get from a local merchant, with the result that a quantity of 18,700 lb. of seed was sold this year as compared with 3,000 last year.

It is hoped that if enough kappas from seed distributed this year can be bought, about double the quantity will be sold next year.

Two seed farms in total extent 35 acres were rented in Koilkuntla taluk and a depot was opened in the village of the same name.

Next year the number of seed farms will be increased to 7, an area of about 200 acres being thus devoted to the production of seed for distribution.

It is satisfactory to note that in buying this seed from the department the ryot in most cases takes enough to sow out the whole of his cotton area, thereby reducing the risk of his seed getting mixed.

(2) *Cotton soil ploughs.*—Owing to the lateness of the season this year, it was not possible to hold any demonstrations in March. Two ploughs were, however, sold.

(3) *Improvements in paddy cultivation.*—A small plot of land was rented for the purpose of demonstrating single planting. The land, however, had not long been brought under wet cultivation and the yields were small, though the results were in favour of that method.

This land has been given up and a fresh plot taken ; the owner has however continued the experiment and has planted the greater part with single seedlings. Seventeen ryots in all have tried this method on small areas.

The number of visitors to the farm this year was 200.

5. *Staff.*—Assistant Farm Manager, K. Narayana Aiyangar was in charge of the farm until November, when he was placed in charge of the cotton work, *vice* Assistant Farm Manager, M. Raghavalu Nayudu, who was transferred to Coimbatore, Assistant Farm Manager, T. S. Venkataramier, taking his place at the farm.

The Bezwada Agricultural Station.

The unsuitability of this farm for experimental purposes has already been referred to. This year's working has emphasized the fact.

2. *Season.*—The total rainfall for this year was 23·5 inches greater than that recorded for last year and 18 inches above the average.

From the middle of June to the middle of November almost continuous rainfall has to be reported.

The early crops were badly affected and the fields ploughed in preparation for late jonna crops became so foul with weeds that they were got ready in time only with great difficulty, a short break in the monsoon in September permitting of this being done at some expense and with the help of outside labour. The labour and seed expended however were lost, since from the middle of that month until the end of the rainy season the fields were never in a fit condition to put foot upon, most of them in fact being under water for a fair proportion of this period.

Altogether the season was most unfavourable and any leeway that had been made up in the eradication of weeds has been lost.

3. *Crops*—(*a*) *Early.*—The early crops sown were sazza, carjonna (fodder sorghum), cambodia and local cottons, maize and dry paddy.

Sazza suffered severely, more particularly the exotic variety Louwveldt. After deducting the area spoilt by waterlogging the yields which are lower than last year are as follows, Transvaal 1,310 lb. per acre, Local 1,273, Louwveldt 695. The results show that, even in a bad year like the one under report, Transvaal sazza at least is able to hold its own against the local variety.

Carjonna.—This crop was somewhat stunted in the lowlying portion of the field, but has yielded fairly at the rate of 11,000 lb. of dry fodder per acre. The quality of the fodder however is poor.

Local cotton.—A small area was sown down with this crop to compare the yields with the late sown crop. Though somewhat stunted in growth, it was otherwise healthy and promises to give a fair yield.

Cambodia cotton.—Periodical sowings were made, beginning early in July, with the object of finding out the best time to sow this crop. The earliest sown plot was a long way ahead of the others and looked like giving an excellent yield, until in the latter part of September it was completely spoilt by heavy rains. It has since picked up but none of the plots are likely to yield much.

Maize.—A similar experiment was tried with this crop. Here, however, it was evident that the earliest sown had not been sown early enough and none of the plots did at all well.

Dry paddy.—This was tried in field No. 2-A, but the field became water-logged and the crop failed to germinate.

(*b*) *Late.*—The late crops were carjonna ratooned, a small area of late sown fodder jonna in place of the grain crop which failed, local cotton, cambodia, horsegram, Bengalgram and maize.

The fodder crops were stunted and gave a very poor yield.

Cambodia.—This crop was sown early in September, but when only about 6 inches high the field was flooded and except on the higher levels the crop for a long time was very poor. Latterly, however, it picked up somewhat and is expected to give a fair yield.

Local cotton.—The cotton was sown very late towards the end of November instead of the beginning of October. It however grew very luxuriantly but was very late in flowering, and picking is just beginning.

Both horsegram and Bengalgram in spite of late sowing and insect attack did fairly well. The former gave a maximum yield of 565 lb. per acre and an acre average yield of 415, while the latter gave 625 lb. and 340 lb., respectively.

Maize.—Both the exotic varieties, Brazilian flour corn and Hickory King, did well and a fair number of good sized cobs were obtained. While green these were eagerly sought after by the residents in the town, but in the district as yet they have not made much headway.

4. *Experimental work.*—With the exception of the experiments mentioned above, none was done.

5. *District work.*—This is of very small dimensions, though every effort is made to interest the people of the district in the farm. Small quantities of seed of Cambodia, Transvaal sazza and of exotic maizes were distributed.

The number of visitors to the farm was 80.

6. *Staff.*—Farm Manager S. Raghunatha Row was in charge of the farm until the 24th August 1910, when he took leave on medical certificate for two years. Farm Manager R. Ramasawmy Aiyar took over charge from him and continued until the end of the year.

The Hindupur Agave Plantation.

The history of this plantation was given in detail in the report for last year, and with the exception of the cutting figures for this year there is little further of importance to be added.

2. *Season.*—Plentiful rains promoted the growth of grasses and weeds and made it difficult to keep the plantation clean, but otherwise the season was favourable.

3. *Operations*—(1) *Planting.*—A few of the nurseries showed signs of overcrowding, and these were thinned, the thinned plants being transplanted out in a small area of about 20 cents prepared for the purpose.

(2) *Retting.*—A quantity of 38½ lb. of *Sisalana* was retted in the vat at Bellary farm. The operation was a long one, taking in all 51 days, though the greater portion was ready in 43 days. The percentage of fibre, however, was high, being as much as 4·3 per cent.

(3) *Cutting.*—Besides the usual two cuttings of *Sisalana* in September and January, a small cutting of *A. cantula* was made and the percentage of fibre tested ·94 lb. of green leaf gave 1¼ lb. of fibre, which works out at the low figure of 1·3 per cent.

The percentage test of *Sisalana* gave the usual figure of 3·5 per cent.

The cutting figures for the last four years have been tabulated and are shown below:—

Year.	Average number of leaves per plant.	Average weight per leaf, lb.	Weight of leaf, lb. per acre.	Yield of fibre, lb. per acre.
1907-1908	15	·7	10,038	351
1908-1909	24	·58	12,284	430
1909-1910	13	·53	6,842	240
1910-1911	15	·47	6,258	219

From these figures it will be seen that the average yield of leaves per plant per annum is 17 and the average weight per leaf ·6 lb. The percentage figure has remained fairly stable at 3½ per cent. and the number of plants per acre is 900. Calculating from this basis it may be taken that the average annual yield on these soils will amount to, in round figures, 300 lb. per acre.

Poling is not yet general as out of the 342 plants in this area only 12 have poled up to date.

4. *Somandapalle.*—This plantation is free from disease, but a number of the plants have been uprooted by wild pigs.

The plantations this year have been under the charge of the Assistant Farm Manager, Bellary.

BELLARY,
12th April 1911.

G. R. HILSON,
Deputy Director of Agriculture, Northern Division.

ADMINISTRATIVE REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, SOUTHERN DIVISION.

I have the honour to forward the administration report of the district work in the Southern Division and of the agricultural stations under my charge.

2. During the year I have been able to spend only 155 days away from head-quarters on tour and I find owing to the large increase in correspondence, already reported, that more and more of my time has to be spent in office work. Now, however, that M.R.Ry. Ramasastrulu Nayudu has been appointed as Assistant Director in this division, I hope to be relieved of much of this.

3. The increase in correspondence in my office has mainly consisted of enquiries from private individuals, which often need careful consideration before answering and occasionally require that some officer should be sent on inspection to the applicant's lands before replying.

4. Except for a period of one month (10th May to 9th June) when I was on privilege leave, I have been in charge of the Southern Division for the year under report. M.R.Ry. D. Ananda Rao, Assistant Director of Agriculture, Northern Division, was in charge of my office during my absence on leave.

5. All the subordinate officers under me, both executive and clerical, have worked well and enthusiastically and have done their utmost to cope with the work, which, without extra assistance, is almost too rapidly developing.

DISTRICT WORK.

6. Now that the work of the several agricultural stations has begun to give some results, the scope of the department has considerably increased, and, in order to bring proved improvements to the notice of the ryot, much more touring has become necessary for the officers attached to these agricultural stations. In some cases it has been found necessary to place officers on special duty in particular tracts. The several lines of work will be dealt with separately.

7. *Cotton improvement.*—Details of this work have been separately submitted with my letter R.O.C. No. 267, dated 21st April 1911, and can be summarised as follows:—

Sale distribution of Karunganni cotton seed.—In all 119,600 lb. of seed sufficient to sow 14,096 acres were sold at 43 depots, mainly in the Ottappidaram taluk of Tinnevelly district. Only 969 lb. of seed remained unsold. It will be seen the quantity sold is less this year than last. This is due to two causes: (1) In many places the ryots had retained seed for their own use from crops raised with seed distributed last year; (2) Seed depots were pushed out much further east this year into a new tract of country and were reduced in places where pure Karunganni is now established. The ryots in this new tract had in most cases already arranged with dealers for their seed supply. Seed stocked at such places could not be moved to where the demand was keen, owing to the tracts through the black soil being impassable at this season.

The distribution of Karunganni cotton seed seems to have already caused considerable improvement in the cotton of the tract. Two firms are opening gins and presses at centres in the tract in which the department have been working, owing to the excellent quality of cotton, which they have noticed to come from there during the past two or three years. The Tuticorin Chamber of Commerce state in answer to an enquiry that they have noticed an improvement in the quality of Tinnevelly cotton during the last two years, but that they are not unanimous in stating whether this is due to the distribution of seed by the department or to favourable seasons. This is corroborated both by Messrs. Ralli Brothers' and Messrs. Volkarts' agents at Tuticorin. As a matter of fact, last year was a most unfavourable season as already reported in last year's administration report of the Koilpatti agricultural station.

The area under drill cultivation also shows a reduction, owing entirely to the season. This year the rains were very late and fearing that they would miss the season altogether, many ryots, who had intended sowing with the drill, sowed broadcast in the dry soil on the chance of the crop coming up when rain fell. When rain did come in November, it was general everywhere and the whole drilled area of 1,637 acres was sown practically within a week. This would have been quite impossible last year owing to the shortage of trained coolies. Thus though both the quantity of seed distributed and the area sown with the drill are less than last year, there has been a steady advance. One very encouraging feature this year is the success met with by adopting drill cultivation for cumbu (the black soil cereal of this tract). Seventy acres were this year sown by ryots with cumbu with the drill and in almost every case, these were the best crops in the village, often giving double the yield of broadcasted crops. By thus expanding the usefulness of the drill to other crops, it is hoped that this will effect a much more rapid expansion of the drill cultivation of cotton. Farm Manager M.R.Ry. A. V. Tirumuruganatham Pillai was in charge of the whole of this work as well as of the Koilpatti agricultural station. The range of work was divided into three circles, the Western Circle being in charge of Assistant Farm Manager (now acting Farm Manager) K. Sankara Aiyar; the Eastern Circle in charge of Assistant Farm Manager T. R. Venkasawmi Rao; and the Northern Circle which was worked by Assistant Farm Manager V. Dhanakoti Raju attached to the Koilpatti agricultural station assisted by the rest of the staff there.

The introduction of Cambodia Cotton.—This is now a common garden crop in the south and it is estimated that this year's crop will be 33,000 bales of 400 lb. Being a very superior class of cotton and a very paying crop, the department has endeavoured to introduce this further afield. Three thousand five hundred and forty-three lb. of seed were sold—2,353 from the Koilpatti agricultural station and 1,190 lb. from the Palur agricultural station. Inspection of Cambodia crops was confined to that grown in the Trichinopoly and South Arcot districts. Assistant Farm Manager V. Dhanakoti Raju toured through the Musiri division of Trichinopoly district; Assistant Farm Manager Kolandaisawmi Pillai (attached to the Palur agricultural station) toured in the Ariyalúr division of Trichinopoly and in the Kallakurchi taluk of South Arcot; and Assistant Farm Manager K. Ramanatha Aiyar (attached to the Palur agricultural station) toured in the Villupuram division of the South Arcot district, giving advice and instructions to intending cultivators of this crop. A start has now been made in both these districts. In South Arcot 40 acres of this crop have been grown this year mainly on garden lands. If this is successful, and prospects seem to point in that direction, it will be a great thing for that district, as it will form a remunerative crop on "groundnut sick" land. It has not been possible to inspect crops elsewhere, but the Tahsildar of Pollachi, Coimbatore district, reports that trials with Cambodia in his taluk are very promising and many ryots are anxious to take up this crop next year. The work of cotton improvement has been met from an allotment of Rs. 31,900–12–8 and the receipts for the year were Rs. 22,989–3–8.

The cultivation of greenmanure crops on wet land.—Experiments in this direction were first started by the Home Farm Superintendent, Sivagiri estate, under the Court of Wards. Considerable knowledge has been acquired since then on the agricultural stations. The question is of special importance in the Southern Division where the use of leaves, collected from waste and forest lands, for manuring wet lands has been an immemorial custom. The expansion of dry cultivation and the reservation of the forests for their protection has reduced the quantity of leaves available, while the area of wet cultivation has increased, and until now, no substitute has been found. This shows the importance of this subject. The department has therefore been purchasing seed of suitable greenmanure crops for sale distribution and about 77,150 lb. of seed have this year been sold sufficient to sow 6,210 acres. This is the second year since the commencement of the sale of greenmanure seeds and it can be at once seen that it will be impossible for the department to manage a very much greater extension of this work. Already the demand for these seeds is greater than what the department have been able to supply. Latterly therefore, with the object of inviting the competition of merchants, the seed has been sold at a price calculated to give a profit of 10 per cent. Thus the work costs the department nothing. Up till now this line of work has been mainly confined to Tanjore and South Arcot districts, while a few preliminary trials have been made in the North Arcot district. In the Cauvery delta, the work of distribution has been very ably carried out by Farm Manager M.R.Ry. C. Narayana Aiyar who has been on special duty in the Tanjore district for the last two years. In South Arcot the work has met with signal success under the guidance of M.R.Ry. S. Subramania Aiyar, Manager of the Palur agricultural station, and the two Assistant

Farm Managers under him. Assistant Farm Manager K. Ramanatha Aiyar of the Palur agricultural station has done the preliminary work of arranging demonstration plots in the North Arcot district with very satisfactory results. Arrangements are now being made under the Periyár irrigation for plots of sunnhemp as a greenmanure crop to be grown by selected cultivators in some 25 selected villages, and it is hoped that very shortly this will solve the much felt difficulty of manuring this large tract of land newly brought under wet cultivation. The arrangement of this work is being carried out by Farm Manager M.R.Ry. C. Narayana Aiyar.

Introduction of better varieties of sugarcane.—In the sugarcane tract around the Palur agricultural station, the Red Mauritius cane introduced by the department has not only to all intents and purposes, ousted the local cane, but has led to a considerable expansion of the cultivation of this crop, as the following comparison of last and this year's figures show :—

	1909–10.	1910–11.
	ACS.	ACS.
Total area under cane	467	923
Area under Mauritius cane	353	888
Area under local cane	114	35
	PER CENT.	PER CENT.
Percentage area under Mauritius cane ...	75·6	96·2

When one considers that the area under sugarcane in India has been practically stationary for the last ten years and that there was a considerable decline in the area when compared with that of the previous ten years, an increase of nearly 97 per cent. in one year is most satisfactory. The expansion of this area is mainly due to Mr. Neilson, Manager of the East India Distilleries and Sugar Factory, who not only has introduced this as a garden crop on lands under wells, but has also assisted in the introduction by supplying sets to intending cultivators and has shown that much better crops can be grown by paying more attention to the detail of manuring, irrigation and drainage.

On the West Coast considerable effort has been made to introduce Red Mauritius canes. From an area of 5 cents planted in 1907 on the Taliparamba agricultural station it is estimated that the area this year will be 21 acres in the two districts of South Canara and Malabar—an increase of 420 per cent. Though the total area seems small, it must be borne in mind that sugarcane is practically a new crop to Malabar and it is only being grown on very small areas of a few cents each for trial. One hundred and forty-one people in Malabar have been supplied with sets for this season's planting from the Taliparamba Agricultural Station, and the total area estimated to be planted from this works out to a little more than 2 cents each. In South Canara sugarcane is a known crop, but most of the cane area is far away from railway communication. Thus though many people are trying these canes, the plots are at present quite small, and it is estimated that in all there are 15 acres of Mauritius canes in this district this year as the result of this and last year's planting. The red Mauritius canes have done remarkably well everywhere on the West Coast and there seems every possibility of a much greater extension as soon as the supply of sets available increases. The canes are larger and sturdier than any of the local varieties, they are proof against jackals and give a much better quality of jaggery. The work of supplying sets, supervising planting and giving advice has been very ably carried out by Farm Manager M.R.Ry. M. Govinda Kidavu and Assistant Farm Manager K. Unnikrishna Menon, both attached to the Taliparamba Agricultural station.

8. *Single planting of paddy.*—This simple improvement in wet land cultivation has been advocated everywhere to wet land ryots, wherever the officers of the department have toured. A special effort was made in the Cauvery delta before last season when three officers of the department were deputed for a period of two to three weeks each to tour through a taluk and to hold meetings at all important villages, distributing vernacular leaflets to those interested. These tours seem to have had a remarkable effect and there is hardly a village where this improvement has not been tried, usually with great success. As a result of this and previous demonstrations, a general reduction in the seed rate is found throughout the district. More care is given to the preparation and manuring of the seed beds, as it is being realised that the improvement is as much due to healthy well-grown seedlings, which are given sufficient room to develop after transplanting, as to planting them singly. Many people now only use a seed rate of three Madras measures (about 8 lb.) per acre in place of the old mamul rate of 42 to 45 Madras measures (about 110 to 120 lb.) for planting their samba crop of red or white sirumani. The following three officers were deputed for this Tanjore tour: Farm Manager M.R.Ry. S. Subramania Aiyar to Shiyali, Farm Manager M.R.Ry. C. Narayana Aiyar to Negapatam and Assistant Farm Manager K. Sankara Aiyar to Kumbakonam taluk. In North Arcot, South Arcot and Tinnevelly, people are also trying this improvement with success. In Malabar, also, many people are reducing their seed rate and planting two to three seedlings. Here the varieties do not tiller so well as on the East Coast and economic planting is advocated rather than single seedling planting.

9. *Introduction of improved implements.*—Around the Palur Agricultural station, the triangular harrow has proved to be a most useful implement. In several villages, it has become a practice to harrow the Vadan samba crops (sown dry and ultimately irrigated), the ryots getting

implements made from the pattern of those lent from the Agricultural station. The Egyptian plough obtained from the Deputy Director of Agriculture, Scind, and reduced in size to suit the South Arcot cattle, is admirably adapted to the sandy loams of the South Arcot district and is now being extensively made for the Palur Agricultural station and sold to applicants The possibility of opening a small factory for making these implements is under consideration.

10. *The Archimedian screw water-lift.*—Several of these have been made and supplied to the ryots of the Tanjore district where there is a large scope for their introduction for low lifts, either for irrigation or for drainage.

11. *General seed distribution.*—This part of the work of the agricultural stations has developed considerably, mainly at Palur, where a much larger variety of crops are grown. The following figures show the number of people supplied with seeds from the agricultural stations in this division :—

—	Palur Agricultural station.	Taliparamba Agricultural station.	Koilpatti Agricultural station.
Number of people supplied.	683	253	105
Quantity supplied ..	Seed .. .. 29,796 lb. Sugarcane .. 30,000 sets. Implements .. 81.	Seed .. .. 4,580 lb. Sugarcane .. 42,705 sets. Pepper .. .. 20,000 cuttings.	Seed .. .. 4,414 lb.

The Palur Agricultural Station.

The season.—This has not been good. The total hot weather showers in April and May only amounted to 0·18 inch. The south-west monsoon opened well with 2·72 inches in the first half of June, by the aid of which the dry land cereals were sown. The young crops suffered much, as after that practically no rain fell for a month. These were however saved from complete failure by a fall of 2·37 inches in the second half of July, by the aid of which groundnuts were interplanted in the cereal crops. The varietal plots of groundnuts were not however sown until August. The August-September rains were about normal in quantity, but these were continuous in the second half of August when 5·18 inches were recorded on 12 rainy days. The cereal crops were then in flower and much of the pollen was washed away before the grain could set. The second half of October was exceptionally wet, 12·48 inches being recorded. The low-lying dry lands were all submerged and two acres of red gram and all the groundnut varietal tests were spoilt. November rainfall was very much below the average and for the last four months of the year no rain was recorded against an average of over 8 inches for the period. The total rainfall for the year was only 33·37 inches against an average for the previous 4 years of 47·59. For wet land crops the season was favourable. The early June rains were utilised to sow sunnhemp on wet land for the samba crop on double crop lands. The first crop season was excellent and for early planted samba crops the season was good, though the shortage of rain in November and the entire absence of rain in December and January decreased the outturn to some extent and were not favourable to late planted crops. Except for the heavy rain in October, the season has been excellent for sugarcane. No rain at the planting time and light showers throughout the early growing period were all favourable, while the dry conditions after the heavy rain of October did much to prevent water logging.

2. *Rainfed crops.*—Dry land cereals have given poor crops owing to the unfavourable commencement of the season. Groundnuts on dry land have given yields considerably higher than the average, except where the crops were sown late and were subject to water logging. Of other dry crops on dry land, fodder cholam has given exceptionally good crops when sown with the south-west monsoon. Crops sown in the second season failed owing to drought. Maize and introduced Cumbu sown in the early season gave only fair yields and the weather conditions were very unfavourable for a mixed crop of cumbu, sunnhemp and redgram grown as a trial to find out how most economically to grow sunnhemp for seed for greenmanuring. The cumbu suffered from drought, the sunnhemp was harvested at the time of heavy rain and much of the seed was spoilt, while the redgram damped off from excessive water logging of the soil.

3. *Crops on garden land.*—Since no rain fell in April-May, the irrigated groundnut crop was poor. Of the irrigated crops in the monsoon season, Cambodia cotton has done well. Onions failed and kadai kanni (*Panicum miliaceum*) gave a fair crop. Of the other varieties of cotton under trial, a variety of Bourbon, probably "Spence" cotton promises very well. Georgia Upland introduced from Georgia State last year is fair and Sea Island is moderate, the last being sown too late in the season.

4. *Crops on the wet lands.*—Sugarcane varieties have done much better than usual, owing to the excellent drainage facilities given to the crop from the time of planting. Several of the recently introduced varieties were brought down from Samalkota and were cultivated here this year. One of the most noticeable features of the crop was the residual effects of a crop of

Sesbania aculeata which was grown for greenmanure and ploughed in for the preceding paddy crop. The paddy crops this season have been remarkably good. The various experiments with manuring, spacing and testing of varieties have been continued. The most useful work in connection with wet cultivation has been the development of the practice of growing greenmanure crops both on single and double crop lands to be ploughed in as manure for the paddy crop. Yields of Samba paddy this year from plots manured with greenmanure are nearly double those obtained in 1908, a year of very good crop. The following are two examples :—

Plot Number.	1908. Yield per acre.	1909. Yield per acre.	1910. Yield per acre.	Remarks.
	LB.	LB.	LB.	
63 (F)	1,296	1,512	2,336	Greenmanured for last two crops with naripayaru or narikaramani (a variety of *Phaseolus aconitifolius*).
65 (B) and (C) ..	1,416	1,380	2,896	Greenmanured with *Sesbania aculeata* for last two crops.

That the effects of a greenmanuring crop will last for more than one year is shown by the yields obtained in another field from which the following acre yields of paddy have been obtained :—

Year.	Yield per acre.	Manure.
	LB.	
1908	924	Half candy groundnut cake.
1909	2,086 (Transplanted)	Sesbania green manure and half candy groundnut cake.
1910	1,668 (Broadcasted)	Ten loads compost * per acre.

* Weeds, etc., collected on the farm and rotted in a pit.

These figures show the importance of this question and the effect of these trials are likely to be far reaching, especially in such tracts where the forests can no longer supply the demand for green leaves.

5. *Seed distribution.*—The total quantity of seed distributed this year from this agricultural station was —

Groundnuts	7,620 pounds.
Paddy	9,140 „
Greenmanure seeds	11,286 „
Miscellaneous cereals	1,750 „
Sugarcane sets	30,000 sets.

6. *Miscellaneous.*—The extension of the seed store commenced last year has been completed and a disused indigo vat which is within the boundaries of the agricultural station, is now being converted into a rest house for Indian visitors. One new pair of bullocks was purchased for the station and one animal was sold. Two bullocks died from obstinate constipation.

The Koilpatti Agricultural Station.

Season.—The season this year has not been favourable and though the total rainfall has been above the average, the distribution has been bad. The hot weather showers, except for two days (April 12th and 15th) when 1·47 and 2·12 inches, respectively fell, consisted of very light showers of less than $\frac{1}{4}$ of an inch. These latter did much more harm than good by preventing the cotton of the summer crop from setting. In the south of the district, conditions were much worse even than on the farm, since in many places no rain worth the name fell and the summer picking of cotton was a complete failure. The south-west monsoon season (June-August) is usually dry, the 35* year average rainfall for this period being 3·11 inches. In the year under report the rainfall amounted to 8·19 inches. Not only was this rain not wanted, but it was actually harmful. This is the season when ploughing is done and weeds such as Hariali grass (*Cynodon dactylon*) are kept in check by this means. A heavy rainfall such as this had the effect of causing this grass to spread more rapidly the more the land was ploughed. Fortunately, the red soil crops were sown this year with the aid of the rains in the end of August instead of being left until September, the usual sowing month when this year only 0·35 inch fell. During September, the crops sown in August suffered much. The rains for the black soil were this year very late and no sowing rain fell until the middle of October, a time when usually the bulk of the black soil sowing is completed. Thus after the cereal crops were sown, the sowing of cotton was not commenced until November, and, owing to frequent light showers, which prevented an entrance into the fields, most of the cotton was not sown till near the end of the month. This has made the cotton crops a month later than usual. Rain stopped on November 18th, when 5·22 inches were recorded and since then until the end of the year only ·02 inch has been recorded against

* At Sattur.

the 35* year average of 6·66 inches. The heavy rain of the 18th which fell within a period of 2½ hours did much damage. None of the field drains or streams were able to carry off this water and bad washes were formed in all directions. This has interfered much with the experimental work on the station. The only point in favour of this north-east monsoon season was that the rainfall was general throughout the district. The failure of the latter part north-east monsoon has resulted in a short crop throughout the district, especially in the south where the sowing season is later than in the north. Of the three main black soil crops, viz., cumbu, fodder cholam and cotton, cumbu has yielded about ⅓rd, fodder cholam about one-fourth, and the yield of cotton will be only about ⅝ths of the average. Matters would be serious in this tract but for the present high prices of cotton.

2. *Black soil crops.*—On the agricultural station, cumbu and cotton have grown well, but fodder cholam and pulses have been practically failures. The success of the cumbu has been entirely due to the method of drill cultivation adopted, and it is encouraging to note that similarly good crops have been obtained in the districts where ryots have adopted this method of sowing and subsequent inter-tillage. We can now say that given an adequate sowing rain, it is quite possible to raise a normal cumbu crop without the aid of subsequent rain by the adoption of drill cultivation. It is doubtful, however, whether, in a normal season, there would be any appreciable difference in the yield between the two methods, drilling and broadcasting. It is too soon yet to speak of the yields of this year's cotton crops, since there is still danger of losing much of the crop, either by aphis, or by unseasonable weather. Last year's yields, however, are now available and show that in a season very similar to this the acre yield obtained was more than that of a 'normal' crop (viz., 97·24 lb. of lint per acre), though not as high as the yields obtained on the farm in the three previous seasons.

The various experiments and demonstrations were continued both on the black and red soil blocks and where results have been obtained, these have confirmed those of previous years. Cambodia cotton has been grown on the red soil under irrigation.

3. *Buildings improvements.*—The seed store and the inspection bungalow built by the Public Works Department have been completed, but have not yet been handed over. Two new cooly huts are being built on the black soil and a portion of the implement shed is being added to the office, while the rest is being enclosed. During the slack season the farm coolies have been employed in revetting the drains (odais) on the black soil and as a result many of the fields are becoming level, while further scouring is checked.

The Taliparamba Agricultural Station.

Season.—The hot weather pre-monsoon showers were this year normal and enabled all operations to be done in due season. This included sowing seed beds for wet and dry crops and sowing dry lands. The monsoon broke as usual in the first week of June. There was a break of a fortnight, during which no rain fell in the middle of July. This did much damage to the hill paddy crops in the neighbourhood and may account for the poor yields of groundnut which were low this year on the farm and seem to have been so throughout the district. Monsoon weather of a weaker type continued until the middle of November and as a result there was a serious loss of pepper due both to shedding and to 'Pollu', an injury caused to the green pepper by the larva of a flea beetle, especially in low-lying damp gardens.

2. *Crops.*—Reference was made last year to the success and distribution to ryots of new varieties of sugarcane. On the farm itself there is nothing to add except that several new varieties and sports are being tested. Three or four of these promise even better results than the Mauritius varieties already introduced. Among these may be mentioned a variety from Fiji (No. B), a variety from the West Indies (No. 1529). B.208 introduced last year still fulfils its promise of being admirably adapted to West Coast conditions.

In Malabar crops of introduced cane have done very well, but here the difficulty is that the crop is usually quite new to cultivation, and the methods of crushing cane and manufacturing jaggery are unknown. The staff of the agricultural station are unable to cope with the amount of assistance required, although a new mill and jaggery-making plant have been purchased for the purpose of helping ryots who are newly trying this crop. The Agricultural Associations could, if they liked, do much to help the department here by lending or hiring cane mills and boiling pans to cultivators in their taluk or division. The Palghat association has recently agreed to do so, but it is now too late for this season's crop. In the immediate neighbourhood of the agricultural station where help can be rendered more easily by the department, sugarcane is becoming a recognised crop, and this year several crops, many of them quite as good as those raised on the farm, have been grown by ryots and milled by the department, the ryots paying for the cost of milling.

3. *Pepper.*—As was expected the yield of pepper this year is low, following as it did, a year of very heavy crop. In general, however, the pepper gardens show a steady improvement and this is borne out by the fact that there have been very few deaths among the vines, which usually follow a year of heavy cropping and the crop is little below the average of the last six years. The plot to which lime and leaf-mould is annually applied still continues to show the

* At Sattur.

value of this as a manure for pepper. This is the only plot on the farm which has this year given a better crop than last year, the plantwar yield, excluding young vines, being ·675 Madras measures against ·629 Madras measures of last year.

4. *Paddy.*—The wet lands continue to give good yields, much above the average of the locality where the methods of wet cultivation are very crude. The average acre yield is this year 887 Madras measures per acre which is slightly less than last season. One important point to be noted is that paddy after sugarcane gives a much better yield than was expected, viz., 570 Madras measures per acre. It would have been thought, with such heavy crops of cane as are raised on the West Coast that the yield of the following paddy crop would have been very much less. The trials of green manuring crops continue to show their value. Cowgram and horsegram grown on the wet land and ploughed in gave an increased yield of 245 and 194 Madras measures, respectively, over a plot which received no manurial application.

On the dry hill land several crops are promising; chief among these are groundnuts, chillies and ginger. The first has not done very well this season, but even then is a paying crop if properly manured. A plot manured with four cart-loads of ashes and four of cattle manure gave a yield worth more than Rs. 35 per acre. This manurial application is not as heavy as would be applied on better soil in the East Coast districts. Chillies gave a dry yield of 1,225 lb. per acre, a very profitable crop considering that it is entirely rainfed and this is likely to be very useful in the district. Ginger gave a yield of 8,376 lb. per acre of green rhizomes which represents a yield of dry ginger of about 1,850 lb. The primary object of these trials is to show how profitable dry land on the West Coast can become when under permanent cultivation. If such a practice were once established in Malabar, it would mean that it would be quite possible to do away with fugitive cultivation and the jungle could then be left to protect the hill sides as well as the valleys below which depend on this jungle for their fertility. Cereals on dry land have this year failed owing mainly to the attacks of wild animals. Such, however, would not be the case if more profitable crops were generally introduced, since the land taken in could be permanently fenced.

5. *Staff.*—Unavoidable transfers of the Officers attached to this agricultural station have not tended towards continuity in management. The Manager was transferred to Coimbatore as Acting Special Assistant to the Principal from 19th May to 19th November. Assistant Manager K. Unnikrishna Menon was away on privilege leave from December 24th 1910 to 16th February 1911. Assistant Manager M. Raman joined the department on 17th June 1910, and was stationed here till 30th September when he had to be temporarily transferred to Koilpatti until 24th December. On again returning here, he had to be relieved and sent to Samalkota on February 6th. These frequent changes made it impossible to pay proper attention to the district work of agricultural improvement.

6. *Miscellaneous.*—The quarters for an Assistant Manager which were commenced last year have been completed during the year under report. The number of visitors continues to increase and it is a promising sign that improvements demonstrated on the agricultural station are being taken up in the immediate vicinity.*

TRICHINOPOLY,
8*th April* 1911.

H. C. SAMPSON,
Deputy Director of Agriculture, Southern Division.

APPENDIX II.

THE ADMINISTRATIVE REPORT OF THE AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE AND THE CENTRAL FARM, COIMBATORE, FOR THE YEAR 1910-1911.

College.—The year under report has marked the completion of the first full course of three years, the first batch of students having been admitted three years ago. It was the first year therefore when three classes have been in residence, and when the College has been working at all under normal conditions. It is to be regretted that the furnishing of the College is still practically the same as it was last year with the exception of the Principal's office room, which has been partially furnished. The Museum, library, lecture room and the rooms connected with the Biological teaching and staff still remain as they were. The Mycologist's room is not yet ready for work. The compound wall has been completed, and after some delay, the drive to the rear entrance of the College made. In other directions progress is less. The water-supply to the College and the whole estate still depends upon two old force pumps worked by hand power which were put in temporarily nearly three years

* *Note.*—The following are the names of crops mentioned in this report:—
Cumbu = Pennisetum Typhoides ; Cholam = Andropogon Sorghum ; Sunn hemp = Crotolaria Juncea.

ago: recently some of the permanent pipes and stands have been put in, but the effect has been at once to increase the consumption of water, so that it is found necessary to cut off the water to the bungalows and quarters every now and then, so that the College tanks may be kept supplied. The Government Botanist's bungalow has never had a proper supply and water has to be carted daily. Latterly the same has been the case with the Agricultural Chemist's bungalow. This paucity of water has rendered very difficult the work of tree-planting, and in present conditions it is not worthwhile proceeding with this work as the trees cannot be properly attended to after planting. The lighting scheme is still under consideration and the College has as yet no system of illumination worthy of it. During the year, the covered way leading to the latrine in one of the Hostel blocks was blown down and was repaired. The faulty construction of the ventilators fitted to the rooms in the Hostels allowed so much rain to penetrate, in addition to what leaked through the roof itself, that in the wet weather of last July most of the rooms became uninhabitable. The attention of the Public Works Department was at once called to it, and recently some of the ventilators have been closed by means of iron sheets: the rest yet remain to be done.

The fire-extinguishing apparatus indented for at the beginning of the year, has not yet arrived and in any case it is not expected that with the present supply of water it would prove of much use. A scheme for collecting the rain water from the College roof was proposed and drawn up, but has not yet been carried out.

The Indian rest-house mentioned in last year's report has not been sanctioned by Government and will not be constructed.

The question of the disposal of the site occupied by the contractor for brick-making has recently been raised, and it has been decided to keep the land and again bring it under cultivation.

2. *Visitors.*—The Commissioner visited the College in January last, the Director of Agriculture four times and the Deputy Directors of Agriculture, twice, for the purpose of examining the students. The Maharaja of Bobbili visited the College in October last and was shown over the whole building. The Hon'ble Rao Sahib N. Subba Rao Garu, M.R.Ry. Rao Sahib M. Abraham Pandithar Avargal, the Hon'ble Raja of Kollengode, the Poligar of Uthukuli, the Hon'ble N. Krishnaswami Aiyangar and the Zamindar of Kadathur—all Honorary Visitors—and His Highness the Madhava Raja of Cochin with the Diwan Peishkar came during the year and were shown the work of the College and Farm.

3. *Students.*—The number of students at the commencement of the session was 49, sixteen of whom were in their third year and completed their course, twelve in the second year and twenty in their first year. Of the third year, fourteen out of the sixteen qualified for the Diploma and were presented with their sanads by the Director of Agriculture (in the unavoidable absence of the Commissioner) at the close of the year. On the same occasion, the Robertson prize was presented to K. T. Alva, L.Ag., and the Clogstoun and Keess prizes—the latter for the first time since its institution, to T. R. Ranganath L.Ag.; all the prizes took the form of gold medals.

The senior students went back somewhat in their third year owing to the lack of staff to assist them and supervise their work, but they benefited very much from a fortnight's good coaching which they received from Farm Manager Balakrishna Murthi, who was relieved for the purpose. They made very good use of the two tours which they had, one in Tanjore and South Arcot, and one in the Ceded Districts and Circars: on both occasions they were accompanied by myself and through the assistance of the Deputy Directors were enabled to carry out a most instructive programme. The second year worked well throughout the year. They cultivated their own plots both dry and wet successfully, and took part in all other farm operations. One student resigned during the second term on the ground of ill-health. Of the twenty new students selected at the commencement of the session, four did not join, and their places were filled up, so that the class started full; one student resigned subsequently and the class stands now at nineteen.

Applications for the coming year are less, only 81 having been received. All students this year will be interviewed by myself before nomination.

4. *Terms.*—There was no alteration in the terms which were as follows:—

	Dates.
Summer	7th June 1910 to 25th September 1910.
Michaelmas	6th October 1910 to 16th December 1910.
Easter	9th January 1911 to 31st March 1911.

Recently however, in view of the long spell of work from June 7th to Christmas with only a week's break, it has been decided to have a fortnight's vacation in September which will enable the students to go back and see something of their own crops, of which, since they take their long vacation in the hot weather, many of them remain ignorant during their stay here.

5. *Work—Agriculture.*—Work in Agriculture has continued according to the programme: and not much alteration will be needed in the scheme of work allotted for the first two years. The work arranged for the third year is however not yet considered satisfactory and further changes will be necessary. By postponing some of the lectures now given to the second year, who have already as much as they can manage, the third year will be able better to combine practical and theoretical work, while changes will also be made in their practical work by giving them full control under supervision, over definite areas of the farm lands.

The Chief Assistant M.R.Ry. J. Chelvaranga Raju took the field classes and corrected the note-books of both the first and second years and also later on supervised the note-books of the third year as well. He was on leave until the middle of the second term, during which his work was done by M.R.Ry. Govinda Kidavu, transferred from the Taliparamba Agricultural Station.

Botany—First year.—The Elementary Biology course was restricted to the first two terms, the third term being left for the study of the Biology of Farm animals.

(1) *Elementary Botany.*—The course consisted of 41 lectures and 56 practical classes. A thorough grounding in the main principles of plant life was given, just so much Morphology and Anatomy being taught as would enable the students to grasp the physiological aspects of the subject.

The first year's course was throughout regarded as a preparation of the students for the longer, second year's course in Agricultural Botany.

(2) *Elementary Zoology.*—A month was devoted to a study of the more important groups of invertebrata.

There were nine classes and the course was regarded as a preparation, on the one hand for the course in the Biology of Farm animals in the third term and, on the other, for the course on Entomology during the second year.

Second year—(1) *Agricultural Botany.*—There were 85 lectures and 72 practical classes. The effect of climate and external conditions on wild and cultivated plants in South India was carefully considered and a short course was given on gardening and Horticultural operations. The more important crops of the Presidency were studied in detail and the general principles enounced of the improvement of crops. Special attention was devoted to seed and plant selection, seed testing and cross breeding.

Mycology—In Mycology a course of twelve lectures and practical classes was given to the second year students at the end of their Botany course. They were given an elementary idea of the nature of a fungus and the damage it causes to its host plant. The students should be in a position to know where to obtain material in any disease they perceive on their crops and how to submit it for detailed examination: they should also be in a position to apply any remedy suggested. The first six lectures were general and dealt with the life history of one or two typical fungi; the second six dealt with the principal diseases of the more important crops of the Presidency.

Entomology.—This course was reduced in length to a class of three hours once a week throughout the year. There were 33 classes held largely of a practical nature. The students were taught to detect and collect insect pests on the crops in the field while lectures were given as to the main groups of insects, the pests of economic importance and the various methods of combating them.

Chemistry.—The main feature of the year's work has been a rearrangement of the classes in Practical Chemistry based upon the report of the external Examiner. In previous years the practical course was finished in the first year, so that when the students presented themselves for their examination at the end of their second year, they were somewhat out of touch with the work. In order to remedy this defect, during the present year, two classes per week have been given to first year students and one class per week to the second year students.

During the session the first year students received 105 lectures in General Chemistry (Inorganic and Organic) and 69 practical classes of 3 hours duration each. The second year students had 66 lectures in Agricultural Chemistry and 34 practical classes. In all the subjects given, the course of instruction was practically the same as that outlined in the last year's report.

6. *Examinations.*—The Diploma examination falls naturally into two parts: that held at the end of the second year and consisting of Agricultural Botany, Agricultural Chemistry and Entomology, and that held at the termination of the third year in Agriculture, Agricultural Engineering and Veterinary Science. In the second part, held this year for the first time, I was assisted by Mr. Clouston, Deputy Director of Agriculture, Central Provinces, and with him, drew up a scheme allotting the proportions to be given to the different subjects and the total aggregate necessary. The examinations in Agricultural Engineering and Veterinary Science were conducted by the Assistants taking those subjects, as the sanction for the deputation of the Principal of the Veterinary College was not received until too late. It is hoped that outside Examiners will be available for all subjects in future. Mr. Clouston expressed himself satisfied at the work and knowledge of the students.

For the examinations in the first part, the assistance of Mr. Warth, Agricultural Chemist in Burma, was again invoked, while for the Botany, Mr. Southern, Supernumerary Agriculturist, was associated with Dr. Barber. The examination in Entomology was conducted by the Assistant who lectures in that subject.

The results are exceedingly satisfactory as all the second year students have passed in all the subjects. Of the third year students who had to reappear for the subjects in which they failed last year all but one have passed. The success of the second year is no doubt partly due to the process of elimination which has already reduced their numbers and all those who will now proceed to their third year are good students who should do the College credit.

7. *Students' Club.*—The Students' Club continues to flourish, in all but its finances, though these are, it is hoped, now on a satisfactory basis. The Club can count on a revenue, apart from the donations of visitors, of about Rs. 100 a term and this has to provide for all the expenditure on games including wages of staff, upkeep of cricket and tennis grounds, as well as purchase of newspapers for the Reading room, and the expenses of Debates, Meetings and Social gatherings. The Club has been handicapped till now by heavy initial expenditure incurred in the purchase of materials and the construction of a new tennis court and is even now slightly in debt, but next term should see it thoroughly solvent. A fair number of matches have been played in hockey and cricket but up to the present only one has been won.

The post of Warden continued to be Honorary throughout the year and was occupied by the Assistant to the Agricultural Chemist, M.R.Ry. Ramaswami Sivan. His work has been very arduous and responsible during the whole period, as his duties have largely increased since the foundation of a mess to which many of the students belong. The original proposal, that students should make their own arrangements, has been found unsuitable for various reasons chiefly the distance from the town and the long hours of the students, and a voluntary mess was started at the commencement of the year which has proved most successful mainly owing to the untiring care displayed by the Warden. Further changes, with a view to putting this mess on a more permanent and quasi-official footing, are now under consideration.

The co-operative society still supplies a great want and fortunately there is a chance that it may become a permanent institution. Proposals are now being considered whereby the stores are to erect their own building on land leased them at a nominal rent by the department. Certain alterations in their rules by which people wishing to purchase from the stores may become associates are also being considered.

8. *The Farm.*—The season has been favourable for wet crops and bumper yields of paddy have been obtained, averaging for the whole area of nearly 40 acres, experimental and non-experimental exactly 3,000 lb. per acre, an increase of about 500 lb. per acre over last year's crop. Though this is partly due to the season, there is no doubt that the care in seed selection and improved methods of cultivation are partially responsible. The various experiments which will be found more fully dealt with in the Scientific Report, have confirmed the value of green manuring, and are indicating great possibilities of the profitable utilisation of artificial manures in combination with green leaf. The sugarcane crop has done very much better than last year and has attracted much attention. The demand for seed canes of the introduced varieties has been fairly brisk and were the staff available for itinerary work, they could certainly effect much improvement.

For the dry crops the season was not so favourable and the break in the monsoon during September and October threatened to become extremely serious, though fortunately rains saved the crop from complete failure. The drilled cotton again has failed to compare very favourably with the broadcasted, but this is partly due to the inexperience of the farm coolies, who are slow in acquiring the necessary skill. The later drilled crops show an improvement over those put in first and confidence in the ultimate success of the drill is unshaken. Experiments with garden crops were again devoted to the more economic utilisation of the water lifted from wells and the ridge and furrow system with ragi proved quite successful. With other crops, various points as to the seed rate, the distance between the rows and the method of sowing have yet to be worked out.

Two machines have been supplied to the farm for official tests: a double diaphragm pump made by the Basel Mission, which has not yet been tested owing to a break in the bullock gear through which it is driven, and the other a sugar-cane mill by Messrs. Burn & Co., who have lately established a depôt in Madras. This is awaiting trial when the cane crop is cut. There has also been some correspondence with the Director of Industries and other gentlemen on the subject of evolving a winnower suitable in price and efficiency to South Indian conditions.

The number of livestock has increased during the year by twenty eight: sixteen births and nineteen purchases while four were sold and three died. Outside relations continue to improve, and an increased number of animals were brought for service and treatment. An outbreak of foot and mouth disease in March last was inconvenient but resulted in only one death while recently rinderpest has been responsible for two deaths. The whole herd were inoculated without delay.

The Dairy is still awaiting completion by the Public Works Department. Efforts have been devoted during the past year to getting together some good cows but they are extremely difficult to obtain as none but the best are needed. The young stock at present number 41 and there has been one casualty among them during the year. It is a matter of the very greatest regret that Bagyam, the mother of the dairy herd, died on the 9th March from rinderpest. She had a splendid record and will be impossible to replace. One other death occurred, but the whole herd of working cattle, cows and calves was inoculated and though two animals are still on the sick list, no further casualties are expected. The care of the livestock generally is in the capable hands of the Veterinary Assistant, who maintains the registers. No arrangements have yet been made for the management of the dairy.

A cross bred Merino ram purchased from the Jail last year has been running with a flock of picked Coimbatore ewes belonging to a shepherd who lives on the estate and there are at present twenty-seven lambs dropped to him, on the estate. The shepherd expresses himself completely satisfied with the ram and there seems to be a demand for the cross bred ram lambs for breeding purposes.

Good progress has been made in laying out the estate, and the Engineering Assistant has supervised the construction of a shed for inflammable materials, such as spirit and ether which it was not safe to store in the College, a Meteorological shed in the College compound where all the Meteorological apparatus is now transferred, a masonry incinerator for disposing of the rubbish collected on the estate, and various minor works such as road making, levelling and repairs to wells. He has also prepared a large scale map of the estate which will be kept up to and of which reproductions can from time to time be made.

The old quarters, mud structures, erected when the farm land was first acquired, were razed and the sites tidied, while an Officers' Club was built on land rented to them.

The sheds erected for the sanitary staff were unfortunately washed away in the heavy rains of October and fresh temporary quarters have been found for them pending the resumption of the land now occupied by the contractor.

The appearance of the estate has however benefited more than anything from the generous prizes offered by the Director of Agriculture, for the best garden, which produced in almost every quarter, what were, in some cases, extremely good and well kept gardens.

9. *Staff.*—The farm staff is still barely able to cope with the work. The three Assistant Farm Managers manage the three blocks, one of wet land and two of dry, north and south and measuring about 42 acres, 197 acres and 109 acres, respectively. Much of this area is double cropped and they have not only to forecast, supervise and account for the labour required, but in addition carry out the large amount of experimental work and maintain the cultivation sheets necessary according to the rules. The Farm Manager is fully occupied with the general management of the farm, while the Office Manager, with the help of the clerk keeps all the accounts, and disburses the whole of the expenditure. Further increase in the staff will be necessary to cope with the work of the dairy, which it is hoped to run as a separate institution, while when the water-supply is handed over, the Mechanic will need assistance in looking after it. All the Assistant Farm Managers have been changed during the year, one going to Samalkota, one to Nandyal and one to Hagari. Assistant Farm Manager S. Subbaiya who was posted for duty here after undergoing a course of poultry training at Pusa, had to be put on to farm work immediately on his arrival, and until he can be relieved, little can be done to make proposals with regard to the poultry section either experimental or educational. The work of Farm Manager has been most efficiently carried out by Balakrishna Murti who was promoted to first grade Manager's post on the 1st July last. Recently M.R.Ry. Ananda Rao, Probationary Assistant Director of Agriculture in the Northern Division, has been posted here to take charge of the farm, which set free Balakrishna Murti to coach the third year students before he took leave on the 11th March. My office staff have also had to cope with a greatly increased amount of routine work, and proposals will shortly be submitted for an extra hand.

Owing to certain changes in apportioning the cost of labour the amounts spent under the varying heads are not strictly comparable with those of last year. The total expenditure has been about the same. The actual expenditure on the farm has decreased by about Rs. 4,000, but there has been some decrease under capital charges.

The charge under maintenance of cattle has increased owing to the increase in the herd, while the expenditure on cooly labour has decreased. The receipts are less by about Rs. 9,000, but this is accounted for by the lateness of the season, no cotton for instance having yet been picked. There is about Rs. 2,000 worth of produce in the store.

COIMBATORE,
9th April 1911.

R. CECIL WOOD,
Principal.

APPENDIX III.

ANNUAL REPORT OF THE GOVERNMENT BOTANIST, 1910–1911.

I have the honour to forward the following report of the work done in my section during the year 1910–1911.

2. *General.*—The work of the various officers continued without interruption. Most of the apparatus in the Entomological and Botanical sections was received by the end of the year but hardly any of the furniture sanctioned by Government was put in. This was found specially inconvenient in the lecture room, the teaching laboratory and the herbarium, these rooms being still largely unfurnished. No iron racks or cup boards were put in the store room where it has become very difficult to keep the things in order and the floor is strewn with delicate apparatus.

3. *Changes in staff, leave, etc.*—The staff remained the same throughout the year with the exception of the dismissal of two plant collectors for overstaying their leave, several changes in the second clerk's post and an acting appointment as Assistant in Systematic Botany. The latter officer returned to duty after many months' sick leave on October 6th and for six months a temporary substitute worked in his place. Several of the other assistants had short periods of privilege leave. The Government Botanist was on leave during April when Mr. K. Rangachariar took charge of the office.

4. *Government Botanist.*—The bulk of the Government Botanist's time was devoted, as during last year, to teaching, and research work was largely relegated to the Economic Assistant. During two periods, together aggregating about one month, he was in charge of the Principal's duties while that officer was on tour with the students. Thirty-five days were spent in touring, Samalkota, Anakapalli, Nellikuppam and the western taluks of Bellary being the chief places visited. Besides many reports of minor importance, the introduction of Cambodia cotton into the western taluks of Bellary received special attention. The routine work of the office was heavy during the year.

Two courses of instruction were given which have been referred to elsewhere. In Elementary Botany 41 lectures were delivered and 56 practical classes held while in Agricultural Botany there were 85 lectures and 70 practical classes.

5. *Systematic Botany.*—The collecting of plants for the herbarium has practically ceased, only two short tours by fieldmen having been made to the neighbouring low hills. Some attention was paid to the various species of *Loranthaceæ* by the Government Botanist while on leave and a considerable collection of these important parasites put together. Some 1,250 plants were worked out in the herbarium and about 200 plants named for various officers and private individuals. Four thousand five hundred sheets were written on and incorporated in the herbarium. A set of 832 named sheets was sent to the Calcutta herbarium and 285 received in return. As already noted the work in this section was rendered more laborious and difficult because of the failure of Public Works Department contractor to make the herbarium cases and working desks.

6. *Economic Botany.*—This constituted the main work of the office in the intervals of teaching. The seed-testing apparatus was got into order and a register maintained. Some 144 samples of seed, chiefly local, were tested as to their germinating power. The farm seed proved on the whole to be very good.

Owing to the receipt of several specimens of seeds for determination, and for assistance in teaching, a seed collection was started. The work proved very laborious, but some 520 numbers have been collected, mostly with herbarium specimens for reference. When this collection is in any way complete it will be possible to test most seed samples for purity as well as germinating capacity, but this has not hitherto been attempted for India.

A number of local drugs were received from the Medical Stores Department, submitted to Botanical examination and determined.

A collection of some 80 samples of agricultural products was put together and forwarded to the Inspector-General of Agriculture.

The collection of crops and their products for the general museum collection was pushed on as fast as the present staff permitted. Four long tours were made by fieldmen and large numbers of specimens were obtained. These will form the basis of an agricultural survey of the Presidency and will serve as a store-house for the museum, while the specimens collected are of constant use in teaching.

Special attention has been devoted throughout the year to the root systems of plants. Selected specimens of all the crops growing on the farm have been dug out and the roots carefully dissected, analysed and photographed. Some interesting results have been obtained regarding the soil and water requirements of different crops.

The study of gogu, *Hibiscus cannabinus*, was continued and brought to a definite stage. The mendelian factors noted were the lobing of the leaves, the colour of the shoot and the markings on the seeds. Six separate varieties have now been made out and grown pure for a

couple of generations. Trials were made as to their production of fibre but these are inconclusive. The next stage will be the growing of them in bulk to determine if they differ in productiveness and the value of their fibre.

In mirabilis the colour factors were further studied. Numerous observations were made with the Tintometer and the working of mendelian laws observed. These plants have proved of the greatest use in training the economic assistant engaged in the cross-breeding work.

The chief work of M.R.Ry. T. S. Venkataraman has, however, been in connection with cotton, and I wish to express my appreciation of his diligence and zeal. Crosses were made and studied between Cambodia and Bourbon, Bombay and Bourbon, Broach and Uppam, Hinganghat and Karunganni, Spence and Bourbon. The aim in this work has been to study the characters of the varieties and to determine the mendelian factors. Thus far it seems certain that the habit of the plant and the shape and size of the bolls are such factors, both of them important from the crop point of view, and it is hoped that, in two plants at least, useful characters have been brought together. Many minor characters have also been studied in the hope of noting correlation with productiveness but nothing very definite has been arrived at.

The cotton seed analysis experiments commenced by the Government Botanist have had to be largely discontinued. Enough observations were, however, possible to make it fairly certain that by careful selection, before sowing, a considerable number of worthless varieties could be eliminated. The teasing of kappas and mounting on sheets was continued as time permitted, and a large collection has been got together by which the relations between size of seed, fuzz and lint can be demonstrated.

Work with cumbus (Pennisetum typhoideum) has failed owing to the non-germination of the seeds of the crossed plants. A number of crops have been examined and separated into groups for further study on the farm, especially red gram, horsegram and castor. In the latter a second generation was grown for the purpose of eliminating the hybrid character usual in the field crops and when this has been accomplished all the varieties are to be tested as to their suitability as food for eriworms. The work on root parasites is at present in abeyance, but a number of attempts have been made to establish *Ximenia americana* in the Botanic garden.

7. *The Botanic Garden.*—The garden has been of considerable use in growing crops for mendelian work, in teaching the students the elements of horticulture and in beautifying the college surroundings. About 400 trees have been planted out and some 10,000 plants distributed, largely to the gardens of the students and staff. The system of lateral protection from the prevailing winds has been largely extended and masses of trees and shrubs have been so placed as to guard the main portions of the garden. A small laboratory has been built, a house for the Overseer and one for eri silk culture. An arch has been erected over the entrance. Considerable difficulty has as usual been found with regard to water-supply and one of the farm wells has been placed at the disposal of the garden by the Principal. But even with this it has not been possible to irrigate the upper, drier portions. Owing to the dismissal of the Overseer a fieldman has been put in charge.

8. *Entomology.*—The work in this section was continued on the usual lines, all reports being sent to the Imperial Entomologist for remarks. The latter officer visited the College in May, examined the collections, went through the records and drew up a programme of work for the year. The section is greatly indebted to Mr. Lefroy for his assistance. The First Assistant remained in charge of the collections, attended to the teaching and the farm pests. During vacations he visited Ganjám, North Vizagapatam, Malabar, South Canara and Kollegal. In the latter taluk he studied the local silk'worm methods and brought mulberry cuttings for growing in the Botanic garden. The Second and Third Assistants toured through the northern and southern portions of the Presidency respectively. Collections were made in Malabar, Bellary, Guntúr, Kistna, Kurnool, South Arcot, North Arcot, South Canara, Tinnevelly, Madura, Ramnad and Trichinopoly districts.

The more important outbreaks of the year were swarming caterpillars on paddy, hairy caterpillars on cereals in South Arcot, the Deccan grasshopper in Bellary, rice bug in South Canara, and these were more or less effectively dealt with. The Bellary grasshopper work carried out by the Second Assistant M.R.Ry. Y. Ramachandra Rao, gives promise of a successful issue and I would draw attention to the good work done by this Officer. He has invented a trap which will be given a further trial during the year.

Sericulture in one form or another has taken up a good deal of time and four experimental broods of eri worms have been raised in the college by the First Assistant. A study of the mulberry silkworm has been commenced and efforts will be made to extend this branch in such places as are suited to it. For the eri work a trained man has been lent by Pusa and a special house has been built in the Botanic Garden.

Leaflets were prepared on the following subjects :—

The swarming caterpillars on paddy in Malabar, hairy caterpillars in South Arcot, the light trap, the rice bug in South Canara, Caneborers, Cocoanut beetles, The Tobacco caterpillar, The Rice Hispa. A note on the life history of coptosoma was prepared by the First Assistant and forwarded to the Bombay Natural History Society for publication.

9. The artist was fully employed during the year and did good work. He prepared 32 diagrams for class work, painted a series of mirabilis flowers and made about 20 line drawings for the Director and other officers of the department. An entomological collector sent down by Mr. Vernon, I.C.S., was trained in insect painting.

COIMBATORE,
11*th April* 1911.

C. A. BARBER,
Government Botanist.

APPENDIX IV.

ANNUAL REPORT OF THE MADRAS AGRICULTURAL CHEMIST FOR THE YEAR 1910–1911.

I have the honour to submit herewith my annual report for the year ending March 31st, 1911.

2. There are no changes to report in the constitution of the staff, but an application has been made for an increase in the number of assistants so as to allow of special investigations being undertaken in particular districts to allow of adequate chemical control in dairy work and to permit of more research work being accomplished.

During the year the following samples have been examined :—

Alkaline soils	1
Soils	143
Sugarcane and sugar-containing plants	68
Sugarcane products	5
Oil-seeds	17
Poonacs	3
Green manures	4
Fish manure	5
Village and farm-yard manure	18
Artificial manures	8
Miscellaneous manures	18
Food-stuffs	8
Waters	14
Silts and silty waters	1
Miscellaneous samples	12
Total	325

This is a decrease of 70 as compared with the number of samples analysed last year, but the decrease is mainly in the number of oil-seeds, sugarcane and alkaline soils, all of which require comparatively little time for examination. On the other hand, the number of soil samples examined has increased from 56 to 143 and as such examinations are usually long and complicated, the time of the two assistants deputed to this work has been fully occupied. In fact it has been found impossible to deal with samples as soon as received and about 70 samples received during the later part of the year are still to be analysed.

In previous reports reference has been made to the fact that persons outside the department were forwarding samples for analysis and report and this year has shown a decided increase in the number of such samples. During the year 1909–1910, the number of external samples received was 59 of which only 15 were soil samples and this year the numbers have increased to 106 and 78 respectively. In addition the number of communications from cultivators asking for advice has greatly increased.

3. With regard to investigations the work connected with the gases evolved from paddy land has been continued and the results of the previous year's work confirmed and at the same time a new field of enquiry has been opened with regard to the nutrition of paddy cultivated under swamp conditions.

4. A large amount of preliminary work has been done on the composition of the black-cotton soils of this Presidency, particular attention being paid to their relation with the underlying geological formation. This work will probably enable these soils to be classified and at the same time throw some light upon their formation.

5. The work in connection with the introduction of manures into the Kistna has been continued and success has been attained in interesting many ryots in the subject such that a firm of manure manufacturers has decided to open depots in the district for the sale of manures. It is probable, that for a year or so, progress will be slow, but the experimental

and demonstration plots have on the whole yielded such encouraging results that ultimate success appears almost certain. So far as the delta as a whole is concerned, it is now possible to indicate in a general way the most effective means of manuring the paddy but incidentally the experiments have shown that the soil of the delta is by no means uniform and that certain areas will require a different manurial treatment to that needed by the greater part of the delta. These experimental results are in agreement with the analytical results obtained from a rough soil survey of the district.

6. The following minor investigations were also carried out:—(1) The manurial value of certain water weeds of the Kolair lake, (2) the value of sweet sorghums from the point of view of jaggery-making, (3) a comparison of the South Canara tobacco with the better sorts of South Indian tobaccos, and (4) the distribution of nitrogen in green-manure plants.

During the year the Agricultural Chemist was on tour for 58 days and members of his staff for 58 days.

COIMBATORE,
7th April 1911.

W. H. HARRISON,
Agricultural Chemist.

APPENDIX V.

ANNUAL REPORT OF THE MADRAS MYCOLOGIST.

I have the honour to submit my annual report for the year ending 31st March 1911.

2. *Staff.*—M.R.Ry. S. Sundararaman Avargal, M.A., Assistant in Mycology returned on 14th April 1910 from a period of sixteen months training at Pusa. He worked throughout the year with the exception of twenty days' privilege leave. He was on tour for 108 days.

3. The laboratory in the Agricultural College is now being fitted and the equipment has begun to arrive during the last month.

4. With apparatus kindly lent by the Imperial Mycologist, Pusa, I have been able to do a certain amount of preliminary investigation of several diseases of crops. But realising that no research work could be undertaken till the laboratory is ready, I have spent a good deal of time touring in order to get to know the crops of the Presidency and their most common diseases. I was on tour 172 days.

Much time was taken up with the palmyra disease operations in Gódávari and Kistna deltas. The area infected by bud-rot has been defined. The work of cutting and burning the crowns of leaves of diseased palmyras is now being carried out over the whole area and with the increased supervising staff the work is being carried out more thoroughly. In the monsoon a series of successful inoculations were made with the fungus causing the disease and the investigation of the methods by which the disease is spread is progressing. In the Nilgiri district the potato crop was examined and the chief diseases found were ring disease and scab of the tubers and "early blight" of the leaves and stems. Several blights of fruit trees were noted there: they will be taken up in the near future.

The three smuts of cholam, long smut, short smut and whole-head smut, caused by *Tolyposporium filiferum Busse*, *Cintractia Sorghivulgaris* (Tul.) clin. and *Ustilago Reiliana Khun*, respectively are under investigation and a simple and cheap method of treating the seed before sowing is being worked out. Smut on paddy is also under investigation.

5. A beginning has been made of cataloguing the fungi on economic plants of the Presidency.

One hundred and nine mounted sheets of diseased plants were received from the Imperial Mycologist's collection at Pusa. Hundred sheets have been added during the year. These form the beginning of a herbarium of the parasitic fungi of Madras and will be a useful adjunct in both investigation and teaching.

A short course on plant diseases was given to the second year students at the end of their Botany course.

COIMBATORE,
12th April 1911.

W. MCRAE,
Madras Mycologist.

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

READ—the following paper:—

Proceedings of the Board of Revenue (R.S., Sur., L.R. and Agri.), No. 280, dated 31st July 1911.

The Hon'ble Mr. A. BUTTERWORTH.

Read—the following paper:—

Letter—from M. E. COUCHMAN, Esq., I.C.S., Director of Agriculture, Madras.
To—the Secretary to the Commissioner of Revenue Settlement, Survey, Land Records and Agriculture.
Dated—the 11th July 1911.
No.—Dis. 1452.

Resolution—No. 280, *dated* 31*st July* 1911.

The Board begs to submit to Government the report of the Director of Agriculture on the operations of the Department of Agriculture for the year 1910–1911. The report is as usual interesting and informing.

2. *Staff.*—The second post of Assistant Director was filled up by the appointment on probation of M.R.Ry. K. Ramasastrulu Nayudu Garu, a graduate of the University of California. Mr. Sampson having applied for six months' leave from 23rd April 1911, Mr. H. Southern, a Probationary Agriculturist at Pusa, was deputed to this Presidency to take the place of Mr. Sampson. Mr. Southern's services were, however, secured with effect from February in order that he might familiarise himself with the work of the division before Mr. Sampson went on leave. It was stated in the last year's review that the addition of an Entomologist to the cadre of the Madras Agricultural Department was required to bring the equipment to the standard originally contemplated. Application was made during the year for the appointment of a European Entomologist and orders have just been received sanctioning the appointment temporarily for a period of five years in the first instance.

3. *Agricultural stations.*—No new Agricultural station was opened during the year under report. In the last year's report, doubt was expressed by the Director as to the successful maintenance of the Agave plantation at Hindupur. Government have since sanctioned the abandonment of the plantation. During the year, the Director of Agriculture also proposed the abandonment of the Bezwada farm owing to its unsuitability for experimental work. The farm came into the hands of the Agricultural Department from the District Board, Kistna, in 1908 and its maintenance by the Agricultural Department was ordered as a tentative measure. The orders of Government on the proposal to abandon it have not yet been received. The season was favourable at Bellary and at the Central farm. At other stations, it was more or less unfavourable.

Sugarcane.—The Red Mauritius is making rapid progress in South Arcot, no less than 96 per cent. of the area under cane in this district being planted with this variety. The Director considers that South Arcot will in time become the leading centre of the sugar industry in Southern India. In Malabar, sugarcane is a new

crop, but it is reported to have made a good start and to be likely to extend rapidly. Experiments at various farms indicate the importance of drainage in the cultivation of this crop.

Ground-nut.—The progress made with this crop in South Canara was unsatisfactory perhaps in consequence of the ignorance of the people in regard to dry cultivation. Experiments conducted at Taliparamba show that ground-nut forms a useful rotation crop on the West Coast and the Director surmises that the growing pressure of population may stimulate the cultivation of this crop.

Cotton.—Valuable work is being done in Tinnevelly and Kurnool in encouraging the growth of superior varieties of cotton and there is every reason to suppose that a permanent improvement in the cotton crop will be secured by the exertions of the department. Karunganni is rapidly becoming the staple cotton crop in Tinnevelly and the cultivation of the remunerative Cambodia cotton has now extended to six districts. In no direction has the department done better work than in regard to cotton.

Paddy.—Special efforts have been made to demonstrate to the ryots of Tanjore the wastefulness of the present methods of planting and there is good reason to hope that a substantial economy of seed will be the consequence. The Director calculates that a saving of Rs. 3 per acre in seed can be effected by the single planting method. In various parts of the Presidency, the ryots are beginning to reduce their seed rate in consequence of the ascertained results of economy in seed.

Green-manuring.—The highly important experiments on the production of good green-manure crops continue. The ryots are beginning to take the matter up and there is every reason to hope that in course of time the growth of green manure will be a regular process in the cultivation of paddy.

Sericulture.—A few broods of Eri silk worms were reared at the Coimbatore Farm and experiments are now in progress to determine whether the industry is likely to turn out profitable. Attention is also being paid to the prospects of extending the Mulberry silk worm industry.

4. *Tobacco.*—The lankas leased to Mr. Barry for the introduction of an improved variety of tobacco were inspected by the Deputy Director of Agriculture, Northern Division. It appears that the season was disastrous, the early seed-beds having been repeatedly destroyed by heavy rain. In spite of this and of the partial failure of the monsoon, good crops were obtained on portions of the land.

5. *Agricultural instructions at the College of Agriculture.*—The Agricultural College has now completed three years of its existence. The first batch of students admitted in 1908 finished their course at the end of the year under report. Their number was sixteen and fourteen obtained the diploma at the final examination. The results of the examination of second-year students in Botany, Agricultural Chemistry and Entomology were even more satisfactory, in that every one of them was successful. These results were recently reported to Government who have been pleased to note the very satisfactory character of the results produced. In order to secure that the maximum strength of 20 students is kept up in the first-year class, the Principal has been instructed to keep a reserve of candidates, from among whom vacancies can at once be filled up.

6. *Non-official visitors to the College.*—The Director's report states that six visits were paid by non-official visitors. The terms of all these visitors have expired except in the case of one. The Board has made proposals for the appointment of a new body of visitors.

7. *Agricultural Associations and Exhibitions.*—Exhibitions and Cattle shows were held at Madura, Tirupur, Berhampur, Pithapuram, Ellore, Kottavalasa, Ongole and Kottacheruvu. The Director's views as regards Agricultural Associations were brought to the notice of Government in Board's reference No. 1191, dated 8th May 1911. The Board has expressed its concurrence in the opinion of the Director as to the general inutility of these Associations.

8. The discontinuance by the Government Botanist of certain branches of economic work has attracted the attention of the Board and the question of making some alterations in his duties is under consideration.

9. *Meteorology.*—The rainfall registered at the various rain-gauge stations was tabulated as usual and the results published by the Meteorologist, Madras, and Deputy Director of the Madras Observatory. The total number of stations in the Presidency at the end of the official year 1910-1911 was 472 inclusive of 84 in the Native States against 476 (revised figure) at the end of the previous year and, of these, 365 stations were inspected.

10. *Statistics.*—The following returns were published in connection with local enquiries under provincial direction :—(1) Monthly season reports in three sections, rainfall, cultivation and prices of food-grains and salt; (2) annual crop forecast reports in respect of cotton, paddy, ground-nut, indigo, sugarcane, castors and gingelly and (3) two quarterly and one half-yearly reports of cattle mortality.

(True Extract.)

S. VENKATARAMADAS,
Secretary.

To the Secretary to Government (Revenue Department).
,, Director of Agriculture.

Order—No. 2707, Revenue, dated 6th September 1911.

Miscellaneous.

Recorded.

2. The report embodies the results of the fifth year's working of the Agricultural Department since its reorganization in 1905–1906, and the Government have no hesitation in endorsing the remarks of the Board of Revenue as to the valuable work which the department has done during that period. In many directions, and notably in the introduction of improved cotton staples, in the establishment of disease-resisting species of sugarcane, in the demonstration of the single-planting method of paddy cultivation and in the operations to check and eradicate the palmyra tree disease, the reorganized Agricultural Department has already achieved results which more than fulfil the hopes with which the reorganization was undertaken. During most of this period the department has been under the direction of Mr. M. E. Couchman, I.C.S., who has just severed his connection with it, and the Government have pleasure in recognizing the considerable share which Mr. Couchman's intelligent and sympathetic administration has had in eliciting the valuable results produced by the experts under his control.

3. In the Agricultural College at Coimbatore the year 1910–11 was marked by the passing out of the first batch of trained agricultural students. Many of these men are reported to belong to the landholding classes and to be going back to the management of their own lands. The Government trust that the knowledge which they have acquired will be turned to the advantage of themselves and their neighbours. The results of the college examinations conducted as these are by independent examiners unconnected with the institution bear testimony to the good work which has been done by the teaching staff.

4. Economic research was carried on throughout the year by the Government Botanist, the Agricultural Chemist, the Mycologist and their assistants. The Government note with special interest the efforts of the Agricultural Chemist to determine the manures suitable to the various soils of the Kistna delta. They hope that he will be able to place his results before the cultivator in such a form that they will be able to appreciate their value.

5. The chief aims of the work of the agricultural stations continue to be the spread of superior varieties of cotton and canes and the advertising of the advantages of single planting of paddy and of the use of green manure crops. The Government recognize the solid benefits which have already been conferred by the department on the cultivators of cotton and cane and note with interest the prospect of a large development of the sugarcane cultivation in South Arcot and on the West Coast. They are pleased to observe the energetic efforts made during the year to propagate the method of single planting of paddy. They trust that similar efforts will be made to introduce green manure crops in those tracts where the manure difficulty is acute.

(True Extract.)

A. G. CARDEW,
Secretary to Government.

To the Board of Revenue (Revenue Settlement).
,, Hon'ble Mr. Chatterton (Superintendent of Industrial Education).
,, Educational Department.
,, Local and Municipal Department.
,, Public Department.
,, Public Works Department.
,, Inspector-General of Agriculture.
,, Minister of Agriculture, Argentine Republic.
,, Entomologist to the Government of India.
,, Mycologist ,, ,,

Copy to the Government of India (Revenue and Agricultural Department) with C.L.

Editors' Table.

REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE,

MADRAS PRESIDENCY

FOR THE OFFICIAL YEAR

1911-1912.

MADRAS:
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS

1912.

Maximum number of pages prescribed—

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Administrative report of the Agricultural stations.	..
The Madras Agricultural Chemist's report ..	..
The Government Botanist's report	4
The Madras Mycological report	..
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REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE

FOR

1911-1912.*

I.—ADMINISTRATION.

(*a*) STAFF.

Mr. M. E. Couchman, I.C.S., was in charge of the office of the Director of Agriculture until 9th August 1911 when he proceeded to England on a year's furlough on medical certificate. I have been acting as the Director of Agriculture from that date. Mr. Couchman spent 48 days on tour in the first four months of the year and I have toured for 101 days during the remaining eight months. Mr. Couchman visited the Coimbatore Agricultural College twice and I visited it on four occasions. I have inspected all the agricultural stations and also attended the meeting of the Board of Agriculture at Pusa in November. Messrs. Barber and Sampson accompanied me to Pusa.

2. Mr. Wood availed himself of five weeks' privilege leave in April and May 1911 and Mr. Harrison, the Agricultural Chemist, was placed in charge of the current duties of his office. Mr. Sampson availed himself of six months' privilege leave and special leave from 22nd April. On his return to duty in October he was placed on special duty for conducting a Cattle Survey of the Madras Presidency—*vide* G.O. No. 2607, Revenue, dated 25th August 1911. The period of special duty was originally fixed at three months but was subsequently extended to eight months—*vide* G.O. No. 1430, Revenue, dated 13th May 1912. Mr. H. Southern, Probationary Agriculturist, was in charge of Mr. Sampson's office from 22nd April up to the end of the year. Assistant Director M.R.Ry. D. Ananda Rao Garu completed his year's training in Farm Management at Coimbatore and was confirmed in his appointment from 18th January 1912. His head-quarters have been fixed at Rajahmundry. Assistant Director M.R.Ry. K. Ramasastrulu Nayudu Garu continued to work under the Deputy Director of Agriculture, Southern Division, Trichinopoly. He is still on probation pending his passing an examination in a vernacular language.

3. The appointment of an European Entomologist, for a term of five years in the first instance, was sanctioned by His Majesty's Secretary of State for India in a Despatch communicated in G.O. No. 2080, Revenue, dated 10th July 1911. Mr. T. Bainbrigge Fletcher, F.E.S., F.Z.S., Supernumerary Entomologist in the Imperial Department of Agriculture, was appointed to this post and joined duty after the close of the year under report, on 24th April 1912. Mr. McRae was confirmed in his appointment as Madras Mycologist in G.O. Mis. No. 989, Revenue, dated 1st April 1912. Application was made towards the close of the year for the appointment of an Assistant Principal and an Assistant Economic Botanist.

4. The minimum pay of Assistant Farm Managers was raised from Rs. 25 to 35 in G.O. No. 2698, Revenue, dated 5th September 1911. The seven permanent vacancies that were reported in this grade in 1909–1910 have now been reduced to three. Two of these three have since been filled. Application has recently been made for the creation of seven more posts of 2nd grade Farm Managers and there is now a fair prospect of filling them if they are sanctioned. The work of the department has been greatly hampered in the past by want of staff and it is hoped that it will be possible to expand in every direction in the future.

* *Note.*—The form of the report has been changed this year in accordance with the wishes of the Government of India—*vide* Madras G.O. No. 3168, Revenue, dated 26th October 1911.

(*b*) Buildings and laying out of Farms.

5. Of the various buildings and other works mentioned in paragraph 13 of last year's report most remained uncompleted at the close of the year under report. The pot culture house was completed in the year and the dairy and the ornamental book cases for the library have since been completed. The Mycologist's bungalow and laboratory, the furniture and alterations in other parts of the college, and the water-supply still remain incomplete. The remaining portion of the water-supply scheme and the installation of vacuum and pressure pumps at a cost of Rs. 10,050 was sanctioned in G.O. No. 786 W., dated 28th June 1911, and the construction of a veterinary hospital was sanctioned in G.O. No. 552 W., dated 25th April 1911. Neither of these works have been completed. The construction of additional quarters for the staff at a cost of Rs. 25,250 was sanctioned in G.O. No. 706 W., dated 17th May 1912, and of a hostel dining hall for the students at a cost of Rs. 2,330 was sanctioned in G.O. No. 459 W., dated 26th March 1912. The construction of quarters for the Entomologist at a cost of Rs. 18,000 has been sanctioned in G.O. No. 325 W., dated 29th February 1912. The 9·56 acres of lands referred to in last year's report have not yet been acquired and handed over by the Revenue Department. The continued delays in completion of works in charge of the Department of Public Works were brought to the notice of Government in November last and a considerable improvement in the rate of progress has since been noticeable.

6. The building of an official bungalow for the Deputy Director of Agriculture, Southern Division, Trichinopoly, at a cost of Rs. 17,570 was sanctioned in G.O. No. 1564 W., dated 17th November 1911. The opening of a new farm at Manganallur, in the Māyavaram taluk of the Tanjore district, was sanctioned in G.O. No. 2586, Revenue, dated 24th August 1911. The land for this farm, consisting of 94 acres, is to be leased from the owner for a period of 7 years. Considerable progress was made with the construction of the necessary buildings and the laying out of the farm before the close of the year and regular work has been commenced with the current year. A new farm at Anakapalle in the Vizagapatam district was sanctioned in G.O. No. 3017, Revenue, dated 11th October 1911. The land for this farm, measuring 41 acres, has not as yet been acquired and handed over by the Revenue Department. The acquisition of an additional 42·61 acres for the extension of the Nandyal farm was sanctioned in G.O. Mis. No. 2830, Revenue, dated 18th September 1911, and this land has since been taken over by this department. The Bezwada farm which had been taken over from the Kistna District Board was handed back to that body, having been found to be useless for the purposes of the department—*vide* G.O. Press No. 2682, Revenue, dated 4th September 1911. Proposals for the abandonment of the Bellary farm were submitted in letter Dis. No. 433, dated 2nd March 1912, and this has since been sanctioned in G.O. No. 1675, Revenue, dated 5th June 1912. The Hindupur Agave plantation was abandoned in G.O. No. 965, Revenue, dated 3rd April 1911, the work there having been completed.

II.—AGRICULTURAL EDUCATION.

7. The second batch of students admitted in 1909 completed their three years' course at the end of the year under report and were examined in agriculture by Mr. A. McKerral, Deputy Director of Agriculture, Burma, in Veterinary Science by Mr. D.A.D. Aitchison, Principal of the Madras Veterinary College, and in Agricultural Engineering by M.R.Ry. Rajagopalaswamy Mudaliyar of the Pumping and Boring Establishment, assisted by the Agricultural College Professors in each case. Ten obtained the Diploma out of 12 who appeared. The two failures were in Veterinary Science and were mainly due to failure to benefit by the practical class work. The examination of the second year students in science was conducted by Mr. F. J. Warth, the Burma Agricultural Chemist and Mr. Southern, Acting Deputy Director of Agriculture, Southern Division, with the help of the College staff. 14 students passed out of the 16 who appeared.

The third-year students made two tours—one in the West Coast districts and one in the Telugu countries. The Principal accompanied them on both the tours. The Deputy Directors, who made the usual two individual examinations of all students in practical agriculture, noted that their tours had had a good effect on the third-year students. A great defect noticed by the Deputy Directors is a lack of intelligent inquisitiveness and power of independent thought, which is, I fear, a temperamental defect of the Indian student which must always make it difficult for him to benefit fully from a practical education.

8. It will be noted that only ten diplomates were obtained this year out of a possible 20, the maximum number in each year's class. Out of the 20 students selected in May 1909, five failed to join at the last moment. Substitutes were obtained for two of them, but, on the other hand, four more withdrew before the end of their first year, so that only 13 remained then. A similar wastage has been taking place in the other years, so that the batches who entered in 1910 and 1911 have been reduced to 16 and 15 respectively. This wastage is partly due to resignation and failure to join at the last moment and partly to the necessity of sending down the students who are unable to cope with the education in pure and applied sciences which occupies the first two years. It has been found by experience that many students of the land-owning classes, who take kindly to the purely agricultural side of the present course, are repelled by the scientific side especially by the practical work in pure science. After a full discussion of the matter with the college staff, I have recently submitted proposals for revising the present diploma course by lengthening it to four years, and by dividing it into a preliminary two years' agricultural course, with lectures in popular sciences but no laboratory work, and a further two years' scientific course. It would be possible to admit 40 students to the preliminary course as the numbers would not be restricted, as now, by the laboratory accommodation available. From these it should be possible to select each year 20 who would be capable of going through the further two years' scientific course successfully. It is hoped that under such a scheme both the number and the quality of the diplomates would be improved, and at the same time the demand for a less scientific, agricultural course would be met.

9. The joint hostel mess continues to be a success. The construction of a special dining hall for this has been sanctioned in G.O. No. 459 W., dated 26th March 1912. During the year the Principal prepared an illustrated College Calendar which it is intended to republish yearly as a continuous record of the college. The first edition has recently been published. The publication of a journal by the students' union has been sanctioned in G.O. Mis. No. 229, Rev., dated 29th January 1912. I have been specially struck by the cordial relations existing between the staff, both European and Indian, and the students at the college. The latter derive much benefit from their intercourse with the former out of class hours, on the playing fields and elsewhere.

10. *Non-official visitors.*—Three visits were paid from non-official visitors during the year. Their remarks have been forwarded to the Board. A revised list of honorary visitors was published in G.O. Press No. 3610, Revenue, dated 4th December 1911.

III.—RESEARCH AND EXPERIMENTS.

(*a*) Agriculture.

11. Full details of the research and experiments in agriculture carried out during the year will be found in the scientific reports of the several agricultural stations which are published separately. The results are also referred to in the administration reports of the Deputy Directors and the Principal, which are printed as appendices to this report. The experiments will now be briefly enumerated and the results obtained summarised. It must be remembered that in the case of crops which are harvested after the close of the official year, the results now discussed refer to the crops of 1910–11 which were harvested in April or May 1911.

12. *Sugarcane— Varieties.*—A number of varieties of exotic and indigenous canes were tested against each other at Samalkota, Palur, Coimbatore and Taliparamba. The canes were analysed by the Agricultural Chemist or his Assistants and the absolute and relative sugar-yielding capacity of each variety determined. At Samalkota the Barbados cane B. 208 yielded at the high rate of 43·9 tons of canes yielding 5·6 tons of raw sugar per acre. Unfortunately this cane is found to be more liable to disease than the lower yielding Red Mauritius cane which has already been distributed throughout the Gōdāvari delta. At Palur the season was a bad one for cane so that little reliance can be placed on the results obtained. At Coimbatore the red and ashy Mauritius cane gave the best results of the varieties tested. At Taliparamba B. 208 showed itself the variety best suited to the climatic conditions of the West Coast.

Seed rate.

An experiment was made at Coimbatore to test whether the high local seed-rate of 35,000 setts per acre is necessary. It was found that 20,000 setts per acre gave a better crop than 10,000, although *a priori* the latter number was thought to be ample. This experiment is being repeated.

Manurial Experiments.

The experiments on the effect of chemical manures in conjunction with castor cake on sugarcane at Samalkota have now proved that the chemical manures do not increase the yield on this land. These experiments will therefore be discontinued. The experiments on the use of lime and cattle manure are being continued. At Coimbatore the experiments were made to test the relative efficiency of six nitrogenous manures which were applied in quantities which supplied 100 lb. of nitrogen per acre. It was found that fish manure gave the best results both in quality and quantity of jaggery.

13. *Ground-nut—Varieties.*—At Palur tests made over the last four years have shown that the local Mauritius variety, which is that commonly raised throughout the Presidency, yields, when properly cultivated, more than any of the exotic varieties that have hitherto been tried. The only exception to this is that the Senegal variety gives a better yield as an irrigated crop.

Rotation Experiments.

It has been shown that about Rs. 50 per acre more value can be obtained by growing groundnut mixed with a cereal such as cumbu or tenai each year rather than by rotating it with such a cereal in alternate years. The conclusion reached last year that it is better to vary the cereal in successive years has been confirmed. With irrigated groundnut an increase from 700 to 1,754 lb. per acre was obtained by rotating with Cambodia cotton. This result requires further confirmation, however, before the increase can be accepted as being entirely due to the rotation.

14. *Cotton—Selection.*—The line on which the selection of plants which give a higher yield per acre and a better percentage of lint to seed than the average is being carried on at the agricultural stations of Bellary, Hagari, Nandyal and Koilpatti was described in detail in paragraph 22 of the report of this department for 1909–1910. This work is being steadily persevered with so that the seed that is issued to the public may improve year by year. The best of the Bellary selections, one of which gave 33·9 per cent. of lint as against the usual local 23 per cent., have now been transferred to Hagari, where selections yielding 28 or 29 per cent. of lint are being grown. At Nandyal one of the selections gave 32·4 per cent. of lint. At Koilpatti, Uppam selections continued to show little promise, the lint being coarse in all cases. The Karunganni selections, however, continue to improve and two or three good strains appear now to be established. The report of the Director of the Imperial Institute states that "the Karunganni cotton is thus seem to approximate in fineness to Egyptian cotton." The Imperial Cotton Specialist values the lint of some of the Karunganni selections at about 18 per cent. above the value of the Uppam cotton. The yield of kappas per acre of these selections is also generally higher than the yield of the unselected crop, so that the object of this work, *i.e.*, the permanent improvement of both the gross yield of kappas, the net yield of lint, and the quality of the lint, in all the important cotton tracts, is being steadily attained. It has, however, been realised this year that cotton plants in the field cross fertilise each other to a greater extent than had been suspected hitherto. This fact makes the raising of pure strains a more arduous task than had been anticipated as there is always a tendency for a selection to revert to the general type by crossing. This work would be greatly facilitated by the assistance of a whole-time Economic Botanist.

Rotation, mixing, etc.

The effect of rotating cotton with a leguminous crop, horse-gram, was shown to be beneficial at Nandyal. At Coimbatore a mixture of cotton and tenai in alternate rows gave slightly better results than a similar mixture of cotton and horse-gram. Experiments to determine the best spacing at which cotton should be drilled showed that a distance of $1\frac{1}{2}$ feet between the lines gave the best results.

15. *Paddy.—Varieties, selections.*—A large number of paddy varieties were tested *inter se* at Samalkota, Palūr and Coimbatore. "Sambalpur" proved a good variety at the two former stations. Each of the local varieties is, however, found to contain a number of different types of varying qualities and the work which is now being undertaken is the selection of single plants possessing the best qualities of each type and the multiplication of the seed of each plant separately year by year, until a sufficient stock of pure seed of each type is obtained to stock seed farms, from which seed can be distributed to the public. A commencement with this work has now been made and important results in the improvement of the local paddy crops should follow in a few years' time.

Seed-rate.

Experiments to determine the best seed-rate for seed-beds and the best distance apart for planting seedlings were carried out at Samalkota, Coimbatore and Palūr. The results which are too many to summarise here, bear out the conclusions already arrived at that the methods adopted by ryots involve a waste of at least three rupees an acre in seed on the average. The experiments are designed to ascertain the optimum spacing for each variety in each tract.

Age of seedlings—Methods of Cultivation.—Experiments were also carried out to ascertain the best age at which to transplant seedlings, and to test the comparative merits of puddling *v.* non-puddling, hot weather ploughing *v.* fallow, drying between each watering *v.* continuous flooding. These experiments must be continued before definite results can be expected.

Manurial.

(*a*) *Concentrated manures.*—The "Patti-mannu" experiments in Kistna confirmed the results obtained before, *i.e.*, that potash is usually not required but that superphosphate or a mineral phosphate is profitable. Check experiments carried out at Coimbatore which had confirmed this result in the previous year, yielded different results this year, superphosphate alone giving poor results. At Samalkota the experiment showed that superphosphate has a good effect when added to a nitrogenous manure, such as castor cake or sunn hemp, while potash either had no effect or else was deleterious. Ammonium sulphate increased the yield, but not sufficiently to cover the costs of the manure. The good effect of liming was found to persist until the second year. At Coimbatore the best financial results were given by black castor cake at 500 lbs. per acre. Bone-meal also gave good results, and fish manure, though not so good as in last year, proved itself to be a cheap and efficient manure. Calcium cynamide also gave promising results. Potash appeared to be not only unnecessary but actually to decrease the yield.

(*b*) *Green Manures.*—Comparative tests of various green manure crops, sunn hemp, (*Crotolaria juncea*), daincha (*Sesbania aculeata*), Teegapesalu (*Phaseolus mungo var*), Narikoramani (*Phaseolous aconitifolius*) were carried out at Samalkota, Palūr and Coimbatore. At Samalkota daincha yielded 14·7 tons of green matter per acre and at Coimbatore sunn hemp gave 7 tons per acre. In all cases the great value of such green manures to paddy was demonstrated. At Palūr the total yearly yield of paddy from the farm has increased from 21,852 lbs. to 40,030 since 1907–1908 and most of this increase must be attributed to green manuring. Individual experiments showed increases of from 50 to 100 per cent. in the yield of grain as the result of green manuring. There is still much to be learnt however as to the effects of continuous green manuring, the necessity of varying the green manuring crops, the necessity of supplementing with artificial manure, etc., and experiments to test these points are being commenced at Palūr and Coimbatore.

16. *Sorghum.*—Selection work on sorghum was continued at Hagari but was spoilt this year by bad germination. The Coimbatore variety 'Periamanjal' was found to be an excellent fodder crop at Koilpatti. The 'Thalaivirichan' variety gave the phenomenal yield of 1,796 lbs. of grain at Coimbatore as the result of deep ploughing.

Ragi.—Varieties of ragi were tested at Coimbatore and experiments to ascertain the best seed-rate were also conducted.

Wheat.—Experiments on irrigated wheat at Coimbatore showed that the local 'bed' system of irrigation gave better yields than a ridge system.

Cumbu.—Selection work on cumbu was continued at Koilpatti. The Transvaal cumbu tried at Coimbatore was fairly successful but was found to cross widely with the local variety.

Pepper.—This was as usual the principal crop at Taliparamba. The response of this crop to manuring and good cultivation is very remarkable. A plot regularly manured with lime and leaf mould has increased its yield from $5\frac{3}{4}$ Madras measures in 1907 to $113\frac{1}{2}$ Madras measures in 1912.

Other crops.—Onions, ginger, turmeric, maize, Bengal gram, tenai, Cambodia cotton, red gram, castor, tobacco, gogu, were grown at various stations to ascertain the best method of cultivation, irrigation, and manuring, and also to test the possibility of introducing particular crops into districts where they are now unknown. Mr. Barry continued his cultivation of exotic tobacco on 150 acres of Lanka land in Gōdāvari.

17. *Special cultivation experiments.*—The effects of continuous cropping with tenai are being tried at Hagari. The rotation experiments with cotton at Nandyal and ground-nut at Palūr have already been alluded to. The effects of mixed cropping with a cereal and a pulse are being tried at Koilpatti. The benefits of ridge planting, of trench irrigation *v.* flat bed irrigation, of deep ploughing and of drilling *v.* broad casting were tried at various stations.

Special manurial experiments—The researches into the best methods of preservation of cattle manure were continued at Koilpatti and the box system continued to give the best results both in quantity and quality of manure.

Permanent manurial experiments.—These were in progress at several stations. Those at Bellary were brought to a conclusion this year and the results obtained were reviewed at length in the scientific report. The general conclusion was that, for black cotton soils in Bellary, the application of chemical manure is of little use; the application of organic manures is beneficial; and of these cattle manure prepared on the box system is the best. The effect of magnesia and of sheep manure were tested at Hagari, and the relative merits of sheep and cattle manure at Nandyal. Green manure on garden lands was tried at Koilpatti and Coimbatore.

Live Stock.—A flock of sheep has been started at Hagari with a view to the eventual improvement of the local wool bearing breed. At Coimbatore the cattle and sheep breeding work continued. It appears that it will be possible to breed animals which will be as good as the best of those bred in the true Kangayam country.

(*b*) Chemistry.

18. The report of the Agriucltural Chemist is printed in Appendix III to this report. The number of analyses performed for private individuals has continued to increase. Mr. Harrison and his Chief Assistant M.R.Ry. M. R. Ramaswami Sivan Avargal have completed their joint research on the black cotton soils of Madras and their results will shortly be published. Mr. Harrison's researches on the gases evolved from land occupied by a paddy crop were continued during the year and already point to very interesting results, which may have an important bearing on the question of the manuring and irrigation of paddy. These researches have not yet reached a stage suitable for publication however. The "Patti-mannu work" is dealt with in paragraph 15.

(*c*) Botany.

19. The report of the Government Botanist is printed as Appendix IV. Owing to the prior claims of teaching and herbarium work research was mainly confined to the study of Cambodia cotton and sugarcane. With Cambodia cotton the work consists of the careful analyses of the several characters exhibited by various crosses with a view to discover the Mendelian characters, and so eventually to evolve a plant possessing those characters which are specially desirable in a field crop. The work was much hampered by an attack of stem weevil and has not yet reached any conclusion. The Government Botanist has been engaged on special researches into sugarcane during the last three months of the year preparatory to his taking charge of the special sugarcane station which is expected to be opened shortly at Coimbatore for a period of five years.

(*d*) Entomology.

20. Details will be found in paragraph 8 of the Government Botanist's report in Appendix IV. The three Entomological assistants continued to work under the Government Botanist, who was however assisted by the Imperial Entomologist.

The first Entomological assistant devoted himself mostly to sericulture which is dealt with in para. 22 below. He also made a study of the life history of the stem weevil on Cambodia cotton at Coimbatore. The second assistant investigated certain of the insect pests found in the northern half of the Presidency. He was mainly engaged in further investigation into the life history of the Deccan grasshopper and of its natural enemies. Experiments were made with various methods of trapping this pest, and bags of the pattern devised by Dr. Coleman in Mysore were found to be the most satisfactory on the whole. A regular campaign against the pest will be organised this year by the Madras Entomologist. The third assistant made investigations into various crop pests met with in his tours in the southern half of the Presidency. An enquiry received from Government as to the necessity of regulating the destruction of wild bees in coffee planting districts could not be investigated this year as the coffee flowering season was over. The Entomologist will study the relations between bees and the coffee flower next season.

(*e*) Mycology.

21. The report of Mr. McRae, the Madras Mycologist, is printed as appendix V to this report. Mr. McRae was mainly engaged with the bud rot disease of palmyras in the Gōdāvari and Kistna districts. He has been specially investigating the cases, in which the disease does not attack the central growing point, and so kill the palm at an early date, but attacks the expanding leaves some distance above the growing point. He has proved that such palms may live as long as $3\frac{1}{2}$ years before they succumb to the disease. Each leaf as it expands,—and one expands every month as a rule,—bears a row of characteristic spots across it. These spots bear spores which are widely distributed by the wind. These trees, which form about two or three per cent. of the trees infested, are thus virulently infectious, yet they are allowed to stand, and are not cut, under the present system of operations, because trees can only be cut with the consent of the tree owners who do not believe that such trees are diseased and eventually doomed. A proposal to introduce legislation to enable such trees to be cut has been negatived in G.O. No. 527, Revenue, dated 23rd February 1912. Every attempt is being made to educate the tree owners to appreciate that their best interests lie in following the advice given them in these matters, but I am not sanguine of real success being attained on these lines. In South Malabar the spraying of arecanuts against Koleroga disease was demonstrated to the garden owners, who are now taking readily to this method of preserving their crops. Sugarcane smut was investigated at Samalkota and the fieldwork on paddy smut was continued. It was found that cholam smut could be successfully combated by the use of a copper sulphate steep for the seed at a cost of about 1 anna per acre sown. Other fungus diseases were investigated, 24 parcels of diseased plants were received from the public and reported on, and the herbarium collection of parasitic fungi was enlarged.

(*f*) Sericulture.

22. The possibility of improving and extending the mulberry silk weaving industry of Kollegal were investigated by the first Entomological Assistant who paid long visits to the chief centres of the industry and embodied the results of the investigation in a draft bulletin. A small experimental brood of mulberry silk worms raised at Coimbatore was a failure, the eggs having been pebrinised. Seven broods of eri silk worms were raised at Coimbatore and consignments of prepared cocoons was sent to certain spinning mills. These were unable to make use of the product. This silk is regularly spun and woven in Bengal so that there can be no doubt that it can be spun and woven in Madras. It has been demonstrated that cocoons can be raised successfully at a small cost, and all that is wanted to establish this as a cottage industry is the organisation of a small spinning and weaving factory at a suitable centre.

(*g*) Pisciculture.

23. Pisciculture is dealt with by a separate department of Fisheries. Details of the work done during the year will be found in appendix VI.

The following is the review, by Sir Frederick Nicholson, of the work of the Fisheries Bureau :—

Fresh water.—The trout, chiefly S. irideus hatched and planted out on the Nilgiris by Mr. Wilson, Piscicultural expert to the Fisheries Department in 1909–1910, had so developed by 1911 that the waters were thrown open to licensed anglers, and many fish were caught, the largest of which weighed 5½ lbs.; the head of fish is very large. The upper waters of the Bhavani and Moyar continued to be conserved against illegal practices, such as dynamiting, poisoning, etc., with the result that there is a marked improvement in the visible quantity of fish. On the plains several large tanks which always contain water were stocked with good fish, and preparations made for stocking others such as the Salem water-works reservoir; two very important schemes were also brought to the report stage and one of these (Kanigiri, Nellore district), was submitted to Government.

The main practical work was done at Sunkesula (Kurnool), at the anicut which feeds the Kurnool-Cuddapah canal which, as well as other waters, it is intended to stock for the 200 miles of its length. This fish farm was brought to practical completion, as the breeding arrangements, stock and fry ponds, were in regular use during the year and a large stock of breeders, chiefly carp of various species and murrel (*Ophiocephalids*) are on hand ready for next season's work; there is, indeed, a surplus of stock fish which must be sold off. At this farm, moreover, the bionomics of our Madras fresh-water fish are being carefully studied, methods of hatching, rearing, and transport suitable to tropical conditions and the nature of the various fish, are being devised, and the fish most suitable for cultivation are being determined. In matters both of pure and applied piscicultural science, the fish farm was duly utilised.

All fresh water operations, whether actual pisciculture or investigations of schemes were devised and carried out by Mr. H. C. Wilson.

Marine.—Actual piscicultural operations were confined to the experimental oyster farm at Pulicat started late in 1910–1911 and now holding many thousands of good oysters, mature though not exceeding 20 months in age. The farm resulted from Mr. Hornell's experiments at the Ennore experimental station and his visit in 1908 to the Arcachon oyster grounds or farms; during the year Mr. Hornell devised various simplifications and economies in the original scheme and enough is now known to warrant larger work.

During the year Mr. Hornell examined and favourably reported on various sites suitable for ordinary marine fish farming in the lagoons and back-waters; a site containing an area of about 160 acres was finally selected at Tuticorin and has since been sanctioned by Government. This site has the advantage of accessibility and of continual supervision by the fisheries staff as well as of proximity to a large market; it is intended to examine the possibilities of breeding some of our best salt water fish in comparative captivity and of studying the bionomics of as many food fish as possible as well as of the chank and pearl oyster. The above farm is the outcome of Fisheries Bulletin No. 6 published in 1911 in which Mr. Hornell described methods of fish farming in France and Italy with suggestions for practical work in Madras, upon which the Madras Government desired that a suitable site should be selected for a fish farm and a plan and estimates submitted.

A scheme for the creation of a breeding reserve of pearl oysters on the Tinnevelly coast, and for inducing the growth of pearls, was also prepared and sanctioned.

Mr. Hornell, as Marine Assistant and Superintendent of the Pearl and Chank Fisheries, devised the above operations and schemes.

IV.—DEMONSTRATION, AID TO THE PUBLIC, SHOWS, AGRICULTURAL ASSOCIATIONS AND GENERAL PROGRESS.

24. *Sugarcane introduction.*—The demand for red Mauritius cane was small in Gōdāvari as the delta is now practically wholly planted up with this cane. The area under this cane near Nellikuppam continues to increase and is now about 3,000 acres. This year the Nellikuppam sugar factory was manufacturing sugar direct.

from the cane. Much of this cane is being grown on garden lands under well irrigation. The sugar industry in South Arcot is now on a firm basis and is capable of great expansion. In Malabar the red Mauritius cane originally introduced by the department is being replaced by Barbados No. 208 which is better suited to the West Coast conditions. The area under cane this year is between 75 and 100 acres. Ryots are purchasing iron mills and are learning how to make jaggery. They are given every assistance possible in this matter, the coolies trained on the farm at Taliparamba being sent out to supervise the work where necessary. There was a great demand for setts for planting this year, over 127,000 being sold. At Coimbatore a demonstration of this year's cane crop and of jaggery making was held in April last and was largely attended by ryots who were entertained by the local Agricultural Association.

25. *Cotton.—Improvement of seed and seed distribution.*—Owing to a poor season in 1910–11 the quantity of seed received from the 574 acres of seed farms in Tinnevelly was less than what has been expected. There was great competition for this seed and the whole stock of 94,968 lbs., sufficient to sow 11,200 acres, was sold at the rate of 10 rupees per pothie of 50 lbs. The ryot can ordinarily get his own seed back from the gin for Rs. 6 per pothie. These figures show what value the ryots put on the improved seed supplied from our seed farms. The seed depots are shifted year by year so that the area under the improved Karunganni crop increases steadily. The Tuticorin Chamber of Commerce informs me that the improvement in the quality of Karunganni cotton noted last year is still maintained. As the selection of better type cottons proceeds at the Koilpatti Agricultural station so the seeds supplied from that agricultural station to the 400 acres of seed farms improves, and in the succeeding years the seed sold to the public from the seed farms carries the good qualities far and wide. In this way successive waves of improvement proceed outwards from the Agricultural station.

In Kurnool and Bellary similar work is in progress. Last year 44,115 lbs. of improved seed were sold. The ryots fully realise the value of this seed and demand, and get, from Rs. 4 to 5 a kantlam (1,500 lbs.) extra on the kappas grown from this seed on account of the higher ginning percentage. The work here will be greatly expanded during the current year, 1,200 acres of seed farm being put down. A marked effect on the general crop of these districts will, it is hoped, soon be noticed. The total net cost to Government of these operations during the working season 1911 was only Rs. 6,013, the sale of lint and seed having accounted for the remainder of the gross expenditure of Rs. 40,928.

Cultivation.—The introduction of drilling continues to make good progress in Tinnevelly. A total of 3,605 acres were sown with the drill this year. Of this 818 acres were under cumbu as against only 70 acres last year. The ryots have been greatly impressed with the value of the drill for cumbu although still rather sceptical about its use for cotton. However once it is widely taken up for cumbu, as it undoubtedly will be, it is only a question of time before the drill is universally used for cotton also. Experiments on the Koilpatti farm leave no doubt as to the relative value of the two methods, drilling and broadcasting. In Kurnool the introduction of the larger Bellary plough is not making much progress. This pattern of plough is not entirely suited to the local conditions. The Deputy Director of Agriculture, Northern Division, has been in consultation with a representative of the plough-making firm of Messrs. Ransomes, Sims and Jefferies, and has also visited the cotton farm at Dharwar in the Bombay Presidency, with a view to obtaining a type of plough more suited to the work required of it. As labour and cattle got more expensive every year all things appear to point to the solution of the deep ploughing question being found in the introduction of some type of power plough on the black cotton soil areas. This development is not being lost sight of by the department.

26. *Cambodia Cotton.*—Cambodia cotton still continues to spread. The estimated crop in the south this year is 80,000 bales as against 33,000 bales last year. In addition it has been tried further north in Bellary, Kurnool and other districts, and has been a success everywhere. Over 31,000 lbs. of seed were sold and a still larger stock will be held this year. The yield per acre continues to be as good as ever but unfortunately the price has dropped this year to the level of Tinnevelly cotton, or even below. This is partly due to the fact that long stapled American

cotton, with which Cambodia competes, has been cheap this year, so much so that one firm has been importing it for use in the local mills. But the fall of price is also due to a deterioration of quality of which most of the mills complain. I have given this matter serious attention and have looked into it at the ginneries and mills in Tinnevelly, Coimbatore, Madras and Kurnool. There is no doubt that much of the Cambodia lint this year is not fit for spinning the finer counts (40 s.) which were spun from it last year. This is partly due to admixture with country cotton and partly to bad quality of fibre. The admixture is partly deliberate,—the dealers hoping to sell a mixture at the price of pure Cambodia which last year was above that of country cotton,—and is partly due to accidental mixture in the ginneries.

But it is mainly due to the carelessness of the ryot who sows mixed seed and who will not trouble to root out the country cotton plants from his Cambodia crop. It cuts the ordinary ryot to the heart to pull up any growing plant that may yield some produce. He affirms that he will keep the produce of the country cotton plant separate when harvesting, but naturally the coolies harvest both together and the result is a mixed crop of uneven staple, which is worth less than pure country cotton, to say nothing of pure Cambodia. A special leaflet No. XVII of 1911 has been published on this subject, and a large quantity of pure seed will be stocked this year. The drop in price has been a good lesson to the ryot and it is hoped that he will learn wisdom and keep his crop purer in future.

The deterioration in the quality of the fibre is a more serious matter. It does not appear to be universal but is mostly met with in Coimbatore where the crop has been very badly attacked by insect pests. This has been specially the case with crops left on the ground too long, or grown near the perennial 'Borboun' cotton of Coimbatore in which pests are endemic. Cambodia cotton will continue to give a crop in the second year if left in the ground. The crop is not good and the plants swarm with insect pests, but the trouble of ploughing and replanting is saved so that some ryots are adopting this practice. In the case of the ordinary country cotton the ground is bare for at least three months in the year and in this time most of the insect pests perish. But if a field or two of Cambodia is left on the ground during this period the starving insect pests naturally swarm to it and not only damage that crop but are carried on until the next year's country cotton crop has grown sufficiently to afford them food. It is thus easy to understand how the growing of a few fields of cotton as a perennial crop may have a very large effect on the prevalence of insect pests. The newly joined Entomologist is making a special investigation of the problem at Coimbatore. I believe that similar trouble in the West Indies was met by a Pest Act making it illegal to carry cotton on the ground beyond a certain date, and I am not at all sure that some such Cotton Pest Act will not be needed in this country in a few years.

I am arranging to send a series of samples of Cambodia to the Imperial Cotton Specialist so that he may investigate as to whether there has been any real deterioration of staple apart from that caused by insect pests. If there has been, and if Cambodia develops a general tendency to deteriorate in staple, it may yet be possible to breed an improved strain which can be kept up and distributed by means of seed farms.

27. *Paddy seed selection.*—So far little has been done to improve the seed of this crop. Single plant selections of the best strains have however been made and in time it will be possible to organise a system of distribution of improved seed just as in the case of cotton. The improvements that have proved successful in paddy are the reduction of the seed rate (single planting) and the introduction of green manuring crops.

Seed-rate.—It has been conclusively proved in the agricultural stations that 20 lbs. of paddy sown thinly in a seed bed is sufficient to provide seedlings for planting out an acre, and that an acre so planted will yield more than if planted in the wasteful indigenous way by which anything up to 150 lbs. of seed are used. There are over 10,000,000 acres under paddy in the Madras Presidency every year. Taking as a conservative estimate that one half of this area is transplanted and that 80 lbs. of seed paddy are used per acre on the average, then it follows that the universal adoption of the reduced seed rate advocated by the department would result in a saving of 300,000,000 lbs. of paddy, worth say Rs. 1,00,00,000 *per annum* in seed alone. The Agricultural Department costs altogether less than 4 lakhs per annum, *i.e.*, less than 4 per cent. of the possible saving to the ryot under this head alone. The

practice of single seedling planting is spreading rapidly as the result of the efforts of all officers of the department. This is specially the case in the southern districts of Tanjore, Madura, Tinnevelly, South Arcot, Coimbatore, Malabar and Chingleput. In the Kumbakōnam division alone the Divisional Officer ascertained that this year there were 5,000 acres, distributed over 144 villages, in which the system had been adopted. Steps have since been taken to ascertain the total area throughout the Presidency, but the figures have not yet been received. I have little doubt that, now that the system has been widely known, it will only need a few years more for it to become practically universal.

Patti mannu work.—The demonstration to the ryots that chemical manures especially phosphates are as good substitute for the patti mannu, or village earth, which is yearly becoming scarcer, were continued in the Kistna district this year. The results were satisfactory and the work here will now be closed as the ryots have grasped the point and are beginning to buy the chemical manures that are offered to them by private enterprise. The same work will now be taken up in the Guntūr district, to the south of the Kistna river, where the conditions are similar.

Green Manuring.—In 1911, a Committee sat at Madura to consider the question of the supply of leaf manure from the reserved forests. This matter had come to a head in Madura where the forests were inadequate to meet the demand of the newly opened Periyar irrigated tract, and were rapidly deteriorating owing to the steady removal of the leaves which should have gone to enrich the soil. It was decided that the proper policy to be adopted in the future was to raise the nominal fees which have hitherto been charged for the removal of leaves from the forests to something like the true market value of the manure, and to encourage ryots to supply their own wants by growing crops of green manure on their lands between successive paddy crops—*vide* G.O. No. 1605, Revenue, dated 29th May 1911.

In pursuance of this policy the charge for leaves has already been raised in several districts, and the Agricultural Department is doing its utmost to supply a sufficient stock of green manure seeds and to instruct ryots in the practice of growing these crops. About 26,000 of Madras measures of green manuring seeds were disposed of last year mostly in Tanjore and Madura where the demand for manure is heaviest. The prices at which these seeds are sold are fixed so as to gain about 10 per cent. profit, in order to leave room for private enterprise. This year a Madura merchant commenced stocking and selling wild indigo seed, which is gratifying. It would be impossible for the department to satisfy the large demand that must soon spring up for such seeds. We can only show the way and it will be for private or co-operative enterprise to take the work over.

28. A consolidated leaflet on paddy cultivation, uniting in one publication all the advice which the department is prepared to give on the question of cultivating and manuring paddy, has been published as leaflet No. 18 of 1911. So far as paddy is concerned the work of the department for the next several years will consist in demonstrating and preaching the principles laid down in this leaflet.

Cattle shows.

29. Cattle shows were held at Ongole and Tiruppur during the year. Mr. Couchman attended the show at Tiruppur in June 1911 and I attended the show at Ongole in March 1912 and also shows at Madura and Tiruppur in May and June 1912, respectively. I am unable to agree entirely with the remarks of Mr. Couchman last year as to the lack of practical value of these shows, but at the same time I must admit that I have not seen many of them. The Madura show was certainly a farce, but the Ongole and Tiruppur shows appear to have some practical value. Mr. Sampson has dealt with this subject in his report on his cattle survey of the Madras Presidency which he has recently completed.

Agricultural Associations.

30. The only associations which appear to take any active interest in their work are those of Kumbakōnam, Malabar and South Canara and possibly Ganjām. The rest are either extinct or almost so. I had been endeavouring to galvanise the Central Agricultural Committee to life and get it to take an interest in a branch of work in which there is much to be done, *i.e.*, the combination of the co-operative credit and agricultural improvement movements. I am afraid however that nothing will result except talk and resolutions. The constitution of the associations was wrong from the beginning and nothing can be done now except by beginning from

the bottom and forming associations of real ryots in the villages. These already exist to some extent in the rural co-operative credit societies and I am arranging to get into touch with these as a first step. The Co-operative Credit department and the Agricultural department have however been working in separate water-tight compartments in the past; for instance, I have not been getting their bulletins nor has the Registrar of Co-operative Credit Societies, much less his subordinates, been getting any of our publications. This has now been rectified and it is to be hoped that these two departments will be able to work together in the future in their joint task of reorganizing the village system of credit, production and distribution.

General Progress.

31. The amount of correspondence between the department and literate ryots grows steadily larger. A perusal of this correspondence shows that the educated cultivating classes are coming to appreciate fully the advantages which they can obtain in the way of advice and assistance from the department. Prices have been good in recent years and ryots are not debarred by the cost from buying improved implements or taking up expensive crops, once they are convinced of the advantages to be obtained. There is no doubt that a very good start has been made and that most literate ryots at least know that there is an Agricultural department to whom they can go for advice and assistance. There remains, however, the great bulk of illiterate ryots who can only be reached by word of mouth or practical demonstration. The latter is supplied by the agricultural stations and the seed farms, and will also be supplied by the example of their literate brethren who have adopted the new methods. The former is supplied as far as possible by touring officers who preach the new methods in the villages and at shows and fairs.

V.—AGRICULTURAL ENGINEERING.

32. In the Madras Presidency much of what is really agricultural engineering is dealt with by the officer, formerly termed the Director of Industries, who is now known as "The Officer in charge of Pumping and Boring Operations." The boring of wells and the pumping of water for irrigation by oil or wind power, although essentially agricultural matters, have always been held to fall under the province of the Department of Industries. Similarly the matters of cotton-ginning, rice-hulling and sugarcane-crushing have been mostly left to that department. I am of opinion that in the future the Agricultural department must pay more attention to the mechanical engineering side of agriculture which is getting more important every year with the rise in prices, and in cost of labour and cattle, and the possibilities opened up by the spread of the co-operative movement. So far the activities of the Agricultural department have mostly been devoted to the popularising of improved indigenous implements, such as the Sindh plough and the triangular harrow, and the cheaper types of light iron ploughs. A new chaff-cutter was tried at Coimbatore and found to work well with sorghum straw but not with green stuff. A visit has been paid to this Presidency by a representative of the famous plough-making firm of Messrs. Ransomes, Sims & Jefferies, and as the result of practical trials and discussions between him and Messrs. Wood and Hilson it is hoped that types of improved ploughs specially suited to the needs of this country will be evolved and placed on the market.

VI.—PUBLICATIONS AND SUPPLY OF INFORMATION.

33. A bulletin, No. 63, on the principles of paddy-manuring by Mr. W. H. Harrison, the Agricultural Chemist, and another, No. 64, by Mr. G. R. Hilson embodying the results obtained at the Hindupur-Agave plantation, were issued during the year. The following leaflets were issued during the year :—

No.			
I.	Instructions for sending plants attacked with parasitic fungi.	Mr. W. McRae	English.
II.	Note on sugarcane cultivation on the West Coast.	M.R.Ry. Unnikrishna Menon.	Malayalam.
III.	A dialogue on single planting of paddy.	Mr. Kolandavelu Udayar.	Tamil.
IV.	A note on wild indigo ...	Home Farm Superintendent, Sivagiri.	Tamil and Telugu.
V.	Bambuchu and how to combat it.	Dr. C. A. Barber ...	English and Canarese.

No.			
VI.	Improvements in ryots' lands.	Mr. G. R. Hilson ...	Telugu and Uriya.
VII.	Advantages of using iron ploughs in black-cotton soils.	Do. ...	Telugu.
VIII.	A note on cocoanut beetles.	Dr. C. A. Barber ...	English, Tamil, Telugu, Malayalam and Canarese.
IX.	Manuring in the Kistna ...	Mr. G. R. Hilson ...	Telugu.
X.	Daincha	Mr. H. C. Sampson ...	English, Tamil and Telugu.
XI.	Cambodia cotton	Mr. G. R. Hilson ...	Canarese.
XII.	Note on potato crop ...	Messrs. McRae and Hilson.	English.
XIII.	Note on sugarcane cultivation on the West Coast.	M.R.Ry. M. Govinda Kidavu.	English.
XIV.	The preservation of farmyard manure.	Mr. W. H. Harrison ...	English, Tamil and Telugu.
XV.	Budrot in Gōdāvari and Kistna districts.	Mr. W. McRae	Telugu.
XVI.	Small ginning factories ...	Mr. M. E. Couchman ...	English.
XVII.	The importance of sowing pure seed of Cambodia cotton.	Mr. H. Southern ...	English and Tamil.
XVIII.	Improvements in paddy cultivation recommended by the department.	Mr. R. Cecil Wood ...	English, Tamil and Telugu.
XIX.	Cotton	Do. ...	Do.
XX.	Sugarcane in South Canara.	..	English and Canarese.
XXI.	Sugarcane	Mr. R. Cecil Wood ...	English, Tamil and Telugu.
XXII.	Jaggery-making	M.R.Ry. D. Balakrishna Murti.	English, Tamil, Telugu, Malayalam and Canarese.
XXIII.	Ginger cultivation on the West Coast.	M.R.Ry. M. Govinda Kidavu.	English, Malayalam and Canarese.
XXIV.	Paddy-manuring	Mr. W. H. Harrison ...	Tamil and Telugu.

34. A printed list of the publications of the department was also published and widely distributed. As the result of this a large number of requests for the issue of old leaflets and bulletins were received, showing that the publications have not been reaching all those who would have liked to receive them. I have therefore taken steps to organise the distribution of leaflets through the Collectors of districts on better lines and have also printed lists of the publications available, in the Agricultural Calendar which was published in March 1912.

Seventy thousand copies of the 1911–12 calendar were distributed and sold altogether, and it is hoped that the 1912 calendar will be even more popular. There is no doubt that this calendar forms one of the most useful means of communication between the department and the educated ryot.

VII.—MISCELLANEOUS.

35. *Conclusion.*—I am shortly to sever my connection with the Agricultural Department, the charge of which I have held during the past year, and I wish to take this oppportunity of placing on record my opinion that the department is well on the right road to realise the immense possibilities that lie before it. Nothing more nor less than a revolution in the methods of local agriculture is to be expected. This revolution has already begun. The practices of buying fresh improved seed, of economising in seed rate, of growing green manure crops and of adopting suitable rotations *are all now firmly established in various tracts where they were unknown hitherto.* There is nothing to prevent these and other improved methods becoming universal in course of time. All that is needed is continued direction and organisation by a staff which must be increased *pari passu* with the spread of enlightenment. As I have shown in the case of one improvement alone, single seedling planting (*vide* paragraph 27 above), the gain to the ryot by these improvements must be reckoned in crores while the cost of the Agricultural Department is reckoned in lakhs. I submit that neither men nor money should be grudged to this department.

MADRAS,
1st July 1912.

G. A. D. STUART,
Ag. Director of Agriculture.

APPENDIX I.

THE ADMINISTRATION REPORT OF THE AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE AND THE CENTRAL FARM, COIMBATORE, FOR THE YEAR 1911-1912.

College.—The college was in full working order during the year. The staff are still hampered by the unfinished state of the rooms, which yet remain to be furnished by the Public Works Department. Of the works mentioned in last year's report, only the Principal's office room has been completed. Furniture for the museum and library has partly arrived and is being fitted; the other rooms remain as they were.

The water-supply not only to the college but also to the whole of the quarters, remains in the precarious state described in last year's report, while the electric light is as yet unfitted. The scheme for collecting the rain water from the roof, has not yet been drawn up.

The fire-extinguishing apparatus has been installed, but in view of the shortage of water, it would probably prove of little use in case of an emergency, while practice is difficult for the same reason. A fire brigade has been organised among the college staff.

2. *Visitors.*—During the year, the college was honoured by a visit from His Excellency Sir Thomas Gibson Carmichael, who, though he was only able to spend a few hours here, was pleased to express his appreciation of what he saw. The Director of Agriculture visited the college six times, and the Deputy Directors three times. The list of honorary visitors was revised by the Government in December: the new list containing 25 names. There have been however during the year only four visits—M.R.Ry. Ramabhadra Nayudu came in May, M.R.Ry. Vengail Krishnan Nayanar in July, and M.R.Ry. Abraham Pandithar Avargal and the Mittadar of Oblinayakkanahalli and Bosinayakkanahalli, Salem district in March. Their remarks were duly forwarded. The late Hon'ble Mr. V. Krishnaswami Aiyar, C.I.E., C.S.I., paid a short visit to the college in August. The Court of Wards, as in the previous year, paid us a visit in July, and suffered defeat from the college cricket team.

3. *Students.*—The number of students at the commencement of the session was fifty, twelve of whom were in their third year, eighteen in their second year, and twenty in the first year. The work of the third year which was largely field and shop work, was supervised by Farm Manager, D. Balakrishna Murthi who was able to devote his whole time to them. They performed two tours, one on the West Coast, and one in the Northern Circars. I accompanied them in each case, and was assisted by Farm Manager, Govinda Kidavu, and Farm Manager D. Balakrishna Murthi respectively. Of the second year, two students were removed at the close of the second term. This should have been done earlier, but my staff was unable to get the students' mark and conduct registers written up to date in time. Assistance has been asked for and it is hoped that an extra clerk will shortly be appointed to help in this work. One student of this class has resigned on the ground of ill-health, and one has failed in the first part of the Diploma, so that the class starts its third year with a strength of sixteen. The first year started full, but two students were removed for failure to profit by the instruction given. It is discouraging to be forced to reduce the classes in this way, but it is difficult in making the annual selection, to choose students of the agricultural classes, or who are *directly* interested in agriculture, possessing sufficient ability. It would be possible to pick a much cleverer class of students, but they would not in most cases be of the right sort, and it is felt that at present the latter is more important.

Applications for the coming year are again somewhat less, being only 75. The realisation of the practical nature of the work here is becoming more widely known, and prevents many useless applications, so that the applications this year are, I think, from more suitable candidates.

4. *Work—Agriculture.*—Further changes will be again necessary in the arrangement of the work for the third year. A Dairy course (see paragraph 10) will be added and each of the students will have to spend some time performing the ordinary routine duties of the Dairy. The system suggested by the Deputy Directors that the supervision of the different portions of the Farm should be so arranged that each student should manage the same portion at stated intervals throughout the year, was adopted, and has been effective in impressing on the students the progress of the seasons and the changing operations of the year.

Botany First year.—The Elementary Biology course was restricted last year to the first two terms, but in the present period it was found necessary to add one class a week during the third term.

(1) *Elementary Botany.*—The course consisted of 56 lectures and 63 practical classes. A thorough grounding in the main principles of plant life was given, just so much Morphology and Anatomy being taught as would enable the students to grasp the physiological aspects of the subject. The first year's course was throughout regarded as a preparation of the students for the longer, second year's course in Agricultural Botany.

(2) *Elementary Zoology.*—Three weeks were devoted to a study of the more important groups of invertebrata. There were eight classes and the course was regarded as a preparation on the one hand for the course on the Biology of Farm animals in the third term and, on the other, for the course on Entomology during the second year.

Second year—Agricultural Botany.—There were about 70 lectures and practical classes. The effect of climate and external conditions on wild and cultivated plants in South India was carefully considered and a short course was given on gardening and Horticultural operations. The more important crops of the Presidency were studied in detail and the general principles enounced of the improvement of crops. Special attention was devoted to seed and plant selection, seed testing and cross breeding.

Entomology.—This course consisted of one class of three hours, once a week, throughout the year. There were 28 classes held, largely of a practical nature. The students were taught to detect and collect insect pests on the crops in the field while lectures were given as to the main groups of insects, the pests of economic importance and the various methods of combating them.

Chemistry.—During the session, the first year students received 95 lectures in General Theoretical Chemistry (Inorganic and Organic) and 63 practical classes of 3 hours duration each. The second year students had 60 lectures on Agricultural Chemistry and 31 practical classes. The average attendance at the classes was very satisfactory and the course of instruction given was practically the same as that outlined in previous year's report.

The exercises given in the practical classes have been printed and bound up in book form and a copy is given to each student.

Mycology.—A course of 12 lectures and 12 practical classes was given to the second year students. The first six dealt with the life-history of one or two fungi and with general characteristics of fungi, the second six dealt with the principal diseases of the more important crops of the Presidency. The students now have an elementary idea of the nature of a fungus and of what it does to its host plant. They are in a position to observe a fungus disease on their crops and they know how to prepare material properly to submit it to the Mycologist for detailed examination. They have been shown how to apply simple remedies and will be able to carry out the instructions they get with regard to the diseases on which they ask our advice.

5. *Examinations.*—The examinations in both parts of the Diploma were conducted according to the scheme worked out last year, which has needed practically no alteration. The first part of the Diploma falls into three groups: in the first, the students have to satisfy a Board consisting of the Principal and the two Deputy Directors that they know sufficient agriculture to continue their studies, while they also have to show that they have gained a sufficient number of marks given for diligence in their practical field classes. The second group comprises the major subjects of Agricultural Chemistry and Agricultural Botany, while the minor subject of Entomology and Mycology fall into the third group.

In the second part, half the total marks are allotted for agriculture; the other two subjects, Veterinary Science and Agricultural Engineering, share the remainder. In all subjects marks are allotted for class work, notebooks and attendance in varying proportion.

This year, the assistance of outside examiners was available in all subjects in the second part, and for Agricultural Chemistry and Agricultural Botany in the first part, as follows: Mr. McKerral, the Deputy Director of Agriculture, South Circle, Burma, in Agriculture; Mr. Aitchison, Principal, Veterinary College, Madras, for Veterinary Science; M. R. Ry. Rajagopalsami Mudaliar, for Agricultural Engineering; Mr. Warth, Agricultural Chemist, Burma, for Agricultural Chemistry, and Mr. Southern, Deputy Director of Agriculture, Southern division, Trichinopoly, for Agricultural Botany.

Out of twelve students examined for the second part of the Diploma, ten passed and obtained their Diplomas, which were presented to them by the Acting Director of Agriculture, Mr. Stuart, on the 29th March. All the three College prizes, the Robertson prize, the Clogstoun prize and the Keess prize, went to the same individual, a Mysore State stipendiary student, Venkata Rao K. Badami, L. Ag. Of the second year, one student failed in Agriculture and, accordingly cannot continue his studies. One student, who has since resigned failed in Agricultural Chemistry All the rest passed in all subjects and will be permitted to continue their third year studies.

6. *Library.*—The library has received a good deal of attention during the year as the following figures will show.

One hundred and four new books were placed on the shelves, 88 obtained by purchase at a cost of Rs. 695, 15 supplied free, and 91 purchased by the Madras Mycologist and transferred by him to the library. Nine new periodicals were sanctioned for purchase by the Government and nine others were received for the first time as exchanges. The circulation of periodicals was maintained to the five outside gazetted officers of the department and the Board of Revenue and the Central Agricultural committe, over 1,100 issues having been thus sent out.

A large number of books, about 200, were bound in the college by the staff, but a proposal to employ a full time binder for this work was negatived, and a large consignment of books are now being bound by the Press at Ootacamund. The catalogue published last year is kept up to date as books are received, while the work of cataloguing the pamphlets and bulletins is proceeding. The collection of photographs was increased by over 200 negatives, most of them taken by the college staff. Many of these were made into lantern slides by the Librarian and will be available for teaching when the electric light installation is completed. The library staff also undertook the sale and distribution of calendars and leaflets.

7. *Students' Club.*—The club has had a successful year and finished free of debt. At cricket it defeated a fairly strong team of the Court of Wards, and in foot-ball it won several matches in a league started in Coimbatore for the first time this year. The physique of the students is good, but they cannot spare the time for sufficient practice to make really efficient teams. B. Dwarakanath won the Tennis cup outright with his third victory and we are now left without a trophy for tennis. K. M. Guru Raja won a medal for being the champion athlete.

M. R. Ry. M. R. Ramaswami Sivan continued Warden throughout the year. The mess was put under his official control and though there have been complaints, it has worked much more satisfactorily this year. It is not possible with the small number of students in residence to suit all tastes, but the appointment of a representative honorary committee among the staff, who pay visits from time to time, prevents any undue preference being given to a particular section. The shortage of water does not tend to lighten the Warden's duties. The good tone of the students is largely due to his influence, while the students have to thank him for the untiring care he displays in promoting their comfort and health. It is largely to his exertions, aided by others of the staff, that the Madras Agricultural Students' Union is in such a flourishing condition. This organization serves to keep up a connexion between past and present students of this and the Saidapet College, and furthers the cause of agriculture in a number of ways.

College Day.—The 7th July, the anniversary of the day when the College was opened by His Excellency Sir Arthur Lawley is made a time of reunion, and the various celebrations, sports, meetings and dinners are run under the auspices of the Union. The Hon'ble Mr. Butterworth, Commissioner of Agriculture, kindly presided at the sports this year and gave away the prizes.

8. *Sanitary.*—There are 91 houses with a population of 350 to be attended to and the work is done by a staff of ten toties working under the direction of the Sanitary Inspector. The latter officer has recently been directed in his rounds to keep an eye on the avenue trees, hedges and beds and has a few coolies working under him who attend to these.

Poudrette has been recently manufactured on a small scale and will be tested for the Farm crops.

The total number of births on the estate was 8, and of deaths 6 during the year.

9. *The Farm.*—The season has on the whole been favourable for both wet and dry crops. The average acre yield for paddy has been less by about 500 lb. than last year, which must have been an exceptionally favourable year. The experimental work, details of which will be found in the Scientific Report will be largely cut down next year, as it is not considered that with the staff and time available it is possible to ensure sufficient accuracy. More work will be done in the way of seed selection and testing. The College Farm will serve more and more as a training ground for newly-joined assistants and students, and less as an experimental and research station. In certain directions however, the practices adopted in the Farm are meeting with the approval of our neighbours, notably in the green manuring and planting of paddy, and the use of one or two implements, and there is little doubt, that, if staff permitted a good deal of useful district work could be done along these lines.

The use of the drill for sowing dry crops is generally adopted on the Farm, though it has not yet shown the superiority which was expected and which has been proved in other districts. The cotton drilling experiments this year have unfortunately failed from a very severe attack of stem borer.

During the year the Farm was visited by a representative of Messrs. Ransomes Sims & Jefferies, the implement makers of Ipswich, who was engaged in studying Indian conditions and testing a number of ploughs which he had brought. The prospect of the introduction of a good iron plough is encouraging, if the right sort of plough is recommended from the start.

10. *Livestock*.—The number of livestock increased during the year by 41, 22 births and 27 purchases, while 3 animals died and 5 were sold. Some of the pure bred Kangayam cattle were sold to the Ceylon and Travancore Agricultural Departments, while recently Messrs. Ranga Raju & Brothers purchased one of the 'Baggiam' bulls.

The Dairy building is still awaiting completion by the Public Works Department. The Dairy has been separated from the Farm from the close of the year under report, and will be run as an entirely separate organisation and more or less on commercial lines. A fair herd of 51, including eight buffalo cows has been got together, but at present only their milk yield has been tested, so that their butter-making qualifications are unknown. It is of course not usual for a dairyman in this country to keep his own cows. Two excellent young buffalo bulls of a good milking strain were purchased during the year, and will be used when mature for improving the local buffalo. The Veterinary Assistant who has general charge of all the livestock, which at the close of the year were valued at nearly Rs. 12,700, has been much handicapped by the absence of a dispensary. This difficulty was partly obviated by giving him one of the rooms in the rest house, and allowing him the use of the stables for his sick beasts.

The number of animals brought from outside for treatment increases, and the number of cows brought for service is so large, that a small fee has recently been introduced.

The cross bred merino ram will soon have to be replaced as he is getting slack. During the year 45 lambs were dropped to him. Some of his former stock have been sold to the Pudukkōttai Darbar, the best being kept to take the old ram's place.

The cowshed has been rebuilt and extended: the old structure being made use of as far as possible. Further extensions are contemplated, with a view to providing room for the increased number of cows and for the young stock. These are being built departmentally under the supervision of the Engineering Assistant, who has also had a good deal of work, supervising the repair and upkeep of the roads on the estate. The Robertson Road has been put in order and affords a pleasant private entrance to the estate from the south: heavy cart-traffic is not permitted on it. The Clogstoun Road has been lowered and widened. The Lawley Road has been thoroughly repaired.

The general appearance of the estate continues to improve. The avenue trees are in most cases growing satisfactorily, and small triangular beds made at the corners of the maidan have been planted and are doing well.

Considerable structural alterations were made to the well in field No. 6. The whole mhote was raised 5 feet and a high level channel was built to supply water direct to the Botanical garden.

11. *Staff*.—M.R.Ry. D. Ananda Rao Garu, Probationary Assistant Director of Agriculture, Northern Division, was in charge of the Farm for the whole period. The work of Farm Manager entails long hours and very little spare time, and the actual practical experience which this officer has gained has benefited him greatly. The permanent Farm Manager, M. R. Ry. D. Balakrishnamurthi was set free to attend to the third year students and to undertake a little district touring: he takes over charge again on the Assistant Director's departure. The students of all classes are so far as this section is concerned, fortunate in having such teachers as the Principal's present assistants, Mr. D'Silva, M. R. Rys. R. V. Subrahmanya Aiyar and J. Chelvaranga Raju.

Assistant Farm Manager, Raghavachari relieved Assistant Farm Manager Raghavalu Nayudu at the end of November: the Farm clerk was changed in January. With these exceptions and except for varying periods of leave, all the executive staff remained unchanged throughout the year.

The Principal's Head Clerk rejoined duty after 1½ years' furlough.

M.R.Ry. J. Chelvaranga Raju and M.R.Ry. D. Balakrishna Murthi did a good deal of work in translating articles into Tamil and Telugu respectively for publication in the calendar and elsewhere, while the latter officer also wrote an illustrated article on the use of power mills for crushing cane, which was published in the Agricultural Journal of India.

12. *Accounts*.—The total expenditure during the year exclusive of salaries of gazetted officers, amounted to Rs. 32,909; this is higher than the previous year by about Rs. 3,000 and is accounted for mainly by the increased cost of feeding cattle, increased 'purchase of live and deadstock'—both capital charges and increased expenditure under 'repairs and upkeep'. The receipts were for the first time classified under various heads, in order to get some idea of the profit or loss from the different branches pursued: the total receipts were Rs. 20,270, Rs. 6,000 more than last year. This year also for the first time since the opening of the Farm a complete stock-taking and valuation has been made, and the following figures may be of interest. The livestock is valued at Rs. 12,700, implements at Rs. 7,000, and machinery and buildings (including Farm Roads) at Rs. 60,205. It should be possible with these figures, to make a correct estimate of the Farm's financial position.

COIMBATORE,
16th April 1912.

R. CECIL WOOD,
Principal.

APPENDIX II.

THE ADMINISTRATION REPORTS OF THE AGRICULTURAL STATIONS DURING THE YEAR 1911-1912.

Administrative Report of the Deputy Director of Agriculture, Northern Division.

I have the honour to submit herewith the administration reports on the agricultural stations under my control with an account of the district work connected therewith.

District work.—The work continues to increase rapidly and the possibilities of its increasing still more rapidly are now limited only by the staff available for this work.

During the year two Managers and three Assistant Managers were engaged solely in carrying on district work and at the same time a certain amount of district work was done by the Managers in charge of the farms, who whenever it was possible to leave the farms toured in the district. During the coming year one Manager and one Assistant Manager will be in charge of district work in Gōdāvari, one Manager in charge of demonstration work connected with the manuring of paddy in Kistna district, two Assistant Managers in charge of cotton work and general district work in Bellary district and one Assistant Manager in charge of district work in Chittoor and Cuddapah.

Cotton work.—During the year 44,115 lbs. of cotton seed were distributed from Bellary, Hagari and Nandyal Farms and from depots in Kurnool district, and 290 acres of seed farms were sown down with selected seed from the farms; 176 in Kurnool district and 114 in Bellary district. No seed was left unsold, the demand being greater than the supply. In Kurnool kappas of sarcar cotton is being brought by dealers at Rs. 5 above the local rate, merely on account of its higher percentage of lint.

Next year 800 acres of seed farms will be sown in Kurnool district and 400 acres in Bellary district while distributing seed to the ryots opportunity is being taken to endeavour to persuade them to pick the kappas clean.

At present in the Ceded districts coolies do not turn out to work during the picking season till about 10 o'clock in the morning and they pick on right through the heat of the day and as they are paid according to weight of kappas picked, the work is done very carelessly, as much of the cotton plant as can conveniently be hidden away in the kappas being collected. To overcome this bad habit higher wages would have to be paid to the coolies for clean kappas and a difference in price would have to be made by dealers in favour of clean kappas. At present the petty dealer knows he can get as good a price for leafy cotton as for clean and naturally does not trouble to insist on the ryot producing only clean cotton for sale and he in his turn continues as before along the line of least resistance. Mere persuasion by the officers of the department will produce no effect; what is required is that exporting firms and spinning firms should insist on having clean kappas and lint from their dealers and should make a difference in price in favour of clean produce.

Assistant Farm Manager K. Narayana Aiyangar was in charge of the work in Kurnool until January when he was joined by Assistant Farm Manager Raghavalu Naidu and both were engaged in this work till the end of the year. At Bellary and Hagari the Managers in charge of the farm carried on the work, next year Farm Manager Ramaswami Pillai will be put in charge of this work in Bellary district.

Sugar cane—Distribution of Seed.—The demand for canes this year was very small. B 208 becomes diseased quickly when grown in the delta and in consequence its distribution there will be stopped. It may however be useful in other parts of the Presidency. Altogether 1,998 canes were distributed during the year.

Improvements in cultivation.—Seventy-six ryots planted canes in rows-55 under the direct supervision of the Assistant Manager in charge of the work and the others of their own accord. The area so planted was 122 acres, but this does not represent the total area for the district as the practice is now beginning to spread.

Improvements in jaggery making.—No demonstrations were held this year, the available men who usually conducted these demonstrations being sent to South Arcot. No increase in adoption of this practice is noted.

Paddy.—One hundred and twenty-two ryots in Gōdāvari district sowed thin seed beds the area sown in this way being 20 acres, and 131 ryots transplanted single seedlings, the area so transplanted being 422 acres; this figure however does not represent the total area transplanted with single seedlings in the district, as this practice is also beginning to spread. The demonstration plot was continued at Nandyal but as yet has had very little effect on the practice of the neighbourhood though distinctly better crops have been obtained by this method. In Bellary district the lack of staff has not permitted of this practice being advocated to any great extent; a few plots were laid down at Hospet and gave good results.

Assistant Farm Manager Ramaswami Aiyar was in charge of this work and the sugarcane work in Gōdāvari district, in the other districts the Managers in charge of the farms carried on this work.

Seed distribution.—14,588 lbs. of good paddy seed mostly konamani and rasangi were distributed for the main crop season of 1911–1912 and 1,705 lbs. all garika sannavari prior to the second-crop season. For the main crop season of 1912–1913, 21,600 lbs. have already been distributed.

Introduction of Cambodia cotton.—Altogether 2,560 lbs. of seed was distributed in this division mostly from Hagari and Nandyal farms. The crop has done well on the whole, though many ryots cultivated the crop rather carelessly. It has now gained a thorough footing in this division and the area devoted to its cultivation will increase rapidly.

In Sirvel taluk in Kurnool district 250 acres were put down under this crop and it is expected that next year this area will increase to nearly 1,000 acres.

Green manure.—The work of distributing green manure seeds has not hitherto assumed any considerable dimensions in this division, partly for lack of staff and partly because the practice of growing leguminous crops after the paddy crop is already in vogue in Gōdāvari and Kistna though the crop is not intended primarily for ploughing in for the benefit of the succeeding paddy crop.

Altogether 926 lbs. of green manure seeds were distributed from all the farms during the official year. At Samalkota 87 lbs. of Sesbania were distributed prior to the main crop season of 1911–1912. Seed distribution for the season 1912–1913 has just finished and 1,430 lbs. of Sesbania seed have been distributed.

Implements.—Attempts are still being made to introduce the black cotton soil plough in Kurnool district. The ryots there however view it with disfavour partly because of the number of cattle required to draw it and mainly because the cattle they employ are of the heavy Nellore breed, suitable enough for drawing heavy loads on an even surface but apt to suffer in their feet when they have to pick their way among the hard clods which fall into the furrow as the plough passes along.

General seed distribution details for each farm will be found in the administration reports.

The Bezwada Agricultural Station.

Proposals for giving up this farm were put forward during the year and were sanctioned before the close of the cropping season. As the staff was urgently required the crops were sold standing, the cattle sent to Samalkota to be disposed of, and the dead stock such of it as was of use transferred to other farms and the remainder disposed of locally.

Assistant Farm Manager Raman who was in charge of the farm at the time was transferred to Samalkota farm.

The Samalkota Agricultural Station.

Season.—The season was on the whole a fair one. The rainfall was normal in amount, though somewhat unevenly distributed. A few showers were received during the month of May and these helped to tide the sugarcanes over this dry period and then a fall of dry weather which occurred in the middle of the south-west monsoon period was rather beneficial than otherwise for this crop, though it made necessary the irrigation of the dry paddies in the farm and materially decreased the yields from dry crops in the district.

Crops—Sugarcane.—This crop was planted in good time, though owing to the previous season having been rather a wet one the land was got ready with difficulty and it was not possible to crow-bar the whole area to be planted. Growth was good both in the farm and in the nursery and though disease was found in both the former and the latter, the attack was not severe.

Two new canes Fiji B and Fiji C were received from the southern division and were grown along with the other varieties. Both grew fairly well but a few canes of latter was attacked by disease B 1529 and B 147. Both did very well this year and on ten cents. plots on the farm yielded at the rate of 21 and 23 candies * of raw sugar respectively though neither was as good as B 208 which from a similar plot yielded at the rate of 25 candies per acre.

	LBS.
* A candy	400

The first named however gave the best analysis this year, the co-efficient of purity being 93·5 per cent.

The average acre-yield of raw sugar for the farm was 6,138 lbs. as against 5,175 lbs. of last year.

Paddy.—Regarding this crop there is very little to report. The crops on the whole were good though smut was more in evidence than in last year, Ratnachudi being the most severely attacked. The average acre-yield for this year's main crop was 2,352 lbs. grain, for last year the yields were 2,109 lbs. grain for the main crop and 1,663 lbs. grain for the second crop.

Green manure crops.—Sesbania, Teegapesalu (Phaseolus mungo var :) and sunhemp were grown as ante-monsoon crops to be ploughed in as manure for the succeeding paddy crops. The two first named gave excellent yields, the former yielding at the rate of 32,000 lbs. of green matter per acre and the latter at the rate of 14,000 lbs. per acre. Sunhemp failed.

Dry and other crops.—Turmeric, dry paddy, red gram, Cambodia cotton and maize were grown on the dry area. Turmeric grew very well and yielded an average acre-yield of 10,306 lbs. green weight as against 6,434 lbs. last year.

Dry paddy was adversely affected by the droughty conditions which prevailed in the middle of the monsoon and the yields are accordingly only moderate. Budama as usual gave the best yield 1,289 lbs. grain, 4,172 lbs. straw per acre. The average acre-yield for all the varieties was 911 lbs. grain as against 863 of last year. Red gram was grown as a mixed crop with dry paddy and yielded satisfactorily giving an acre-yield of 595 lbs. as against 748 lbs. last year. Cambodia was sown out in small plots at intervals during the season, in order to find out the best time to sow it. Pickings are still being made. Maize was a poor crop.

Experimental work.—The following additional experiments were laid down during the year :—

To test the effect of an application of lime on paddy.—Lime was applied last year to part of the sugarcane crop in field No. 18 and comparative plots limed and unlimed were laid out this year. The result show a better yield for the limed plot.

2. *To test the effect of drainage on paddy.*—Drains were dug all round a plot of paddy and after the crop was established water was run into the field and allowed to escape into the drain, the field was then left unsubmerged as long as possible before a fresh supply of water was given. The crop was normal and only 19 waterings were required as against 24 given to the check plot.

3. *Ploughed and unploughed fallow.*—Two even plots were taken one of which was ploughed during the dry season and the other left unploughed. The after-treatment was alike. The object of this experiment is to test whether this stirring of the soil during the dry weather will lead to an increase of yield of paddy. The year's result are against ploughing.

As a result of the experimental work which has been done, it has been concluded—

1. That for sugarcane the addition of chemical manures to the ordinary application of castor cake is not beneficial.

2. That the adoption of a seed rate of 100 kunchams (700 lbs.) per acre for sowing paddy seed beds is wasteful and leads to a decrease in yield from the crop.

3. That transplanting paddy twice does not pay.

In accordance with these conclusions this manurial series of sugarcane has therefore been given up and a series of manurials with different kinds of oil cake has been introduced, the 100 kanchams plot has been given up and one of 30 kanchams will be introduced and the experimental work to test the effect of twice transplanting will be discontinued.

Seed distribution.—The following quantities of seeds have been distributed during the year :—

	LBS.
Paddy—	
Konamani	10,689
Rasangi	1,320
Other varieties	2,579
Garika sannavari	1,705
Green manure seeds	165
Sugarcane	1,998
Miscellaneous	60

Staff.—Farm manager Muthusami Aiyar remained in charge of the farm throughout the year. Assistant farm manager Sitaramaswami Naidu was on leave till October 10th from which date he continued till the end of the year. Assistant Farm Manager V. S. Ramaswami Aiyar took charge of the district work from the beginning of the year and continued in charge throughout. Assistant Farm Manager Raman was transferred to this farm from Bezwada in February and continued till the end of the year.

The Hagari Agricultural Station.

Season.—The season was unfavourable more particularly for food crops than for cotton, though better here than at Bellary where the rainfall was less by two inches than that recorded for this farm.

The early rains failed and in consequence the early crops "korra" (*Setaria italica*), and "sazza" (*Pennisetum typhoideum*) were sown a month late and did very badly.

The short rainfall also necessitated more frequent waterings being given to the garden crops and considerably added to the expense of cultivation.

Crops—(*a*) *Early.*—As stated above the yields were poor. Korra as a mixed crop with cotton gave an average acre-yield of only 107 lbs. grain and 190 lbs. straw and as a pure crop of 158 lbs. grain and 497 lbs. straw, the yields last year being respectively 358 lbs. of grain and

368 lbs. of straw and 365 lbs. grain and 383 lbs. straw. Sazza in field No. 11 did a little better than korra but in field No. 9 practically failed. The average acre-yield for the year was 260 lbs. of grain and 810 lbs. of straw considerably less than last year when the average acre-yield was 443 lbs. of grain and 1,058 lbs. of straw.

(*b*) *Late—Cotton.*—Considering the shortage of rain this year the yields obtained from this crop, grown as a pure crop are distinctly good, the average acre-yield of kappas being 367 lbs. as against 286 lbs. of last year. As a mixed crop with korra however it practically failed yielding only 77½ lbs. of kappas per acre, a miserable return compared with the average for last year which was 212 lbs. per acre.

Sorghum.—As far as the yield of grain is concerned this crop failed, the yield of straw is however fair. In some of the fields no grain at all was obtained and in the others only plants favoured either by being at the border of the field or in a lower lying piece of ground matured grain. The average acre-yield was 25 lbs. of grain, 700 lbs. of dry fodder and 294 lbs. of green fodder which was fed to the cattle before the crop was harvested. Last year the average acre-yield was 405 lbs. of grain, 600 lbs. of dry fodder and 220 lbs. of green fodder.

Garden.—As regards this area there is as yet very little to report. The crops this year were only fair and most of them have yielded some profit though the expenses of cultivation were heavier than they would be in an average year. Cambodia cotton has done the best in this respect a plot of 40 cents yielding at the rate of 900 lbs. of kappas for the first picking. The second picking is still in progress. Red Mauritius sugar-cane brought from Samalkot last year was not a success being badly attacked by stem-borer. It is being tried again.

Experimental work.—On the black cotton soil area the experiments already laid down were maintained and selection work in cotton and sorghum was continued. Sufficiently large quantities of lint of selected cottons Nos. 1, 2 and 3 were obtained from the 1910–1911 crop to enable a spinning test to be made. Messrs. Binny & Co., Madras, who were good enough to carry this out for us reported Nos. 1 and 2 to be practically equal and better than 3 and seed of these two types was accordingly sown out on seed farms to obtain as much seed as possible for distribution, 114·5 acres altogether, partly on the farm and partly outside being sown in this way.

As regards *sorghum* the bad season made it impossible to arrive at any definite conclusions as to the merits of the different strains sown.

In the garden experiments have been laid down in the sandy area to test the effect of an application of (1) silt alone, (2) the local pati-mannu alone, and (3) Superphosphate after giving a dressing of lime and ploughing in a green-manure crop. Ridge planting of onions and ragi as compared with planting on the flat bed is also being tried and selection work in maize, ragi and chillies has been begun.

Distribution of seed.—The total quantity of seed distributed was as follows:—

Local cotton	6,308	pounds.
Cambodia cotton	1,267	„
Green-manure seeds	371	„
Miscellaneous	172	„
Sugar-cane	100	canes.

Practically all the local cotton seed was distributed to neighbouring villages, the equivalent acreage being 250. Of the Cambodia seed distributed 1,160 lbs. was taken by ryots in the three taluks of Bellary, Rayadrug and Gooty, the remainder going to other parts of the Northern division.

Staff.—Farm Manager Ramasami Pillai remained in charge of the farm throughout the year. Assistant Farm Manager Raghavachari was posted to this farm and remained for one month until the 4th May 1911 when he was removed and his place was filled by Farm Manager Rajagopalachari who continued till the end of the year.

The Bellary Agricultural Station.

Season.—The season was a poor one. The early south-west monsoon rains were not sufficiently heavy to permit of early crops being sown, and the total rainfall was not great enough to afford sufficient moisture for the proper maturing of the main crops.

2. *Crops—Main.*—The yields were very poor, the acre average yield for sorghum for the whole farm being 43 lbs. of grain and 1,090 lbs. of straw, while the best yield of grain (534 lbs. per acre) was obtained from the no-manure plot in the permanent cotton manurials and of straw (3,800 lbs. per acre) from the superphosphate plot in the same series. Cotton as a pure crop averaged 137 lbs. per acre and as a mixed crop only 24 lbs. per acre.

3. *Experimental work.*—The permanent cotton manurial and the permanent rotation manurial plots were both cropped with sorghum this year. The results of the latter have been summarized and the conclusion arrived at is, that for dry cultivation on the black-cotton soils of this district chemical manures such as saltpetre and superphosphate are of little benefit and that

organic manures are of distinct benefit, their use leading to an increased yield of both grain and straw. The results also point to the conclusion that of the organic manures used, viz., box manure, pit manure, heap manure and safflower cake, the first named is the best.

As this farm is unsuitable for experimental work, proposals have been put forward to give it up. In the meantime until its fate is decided the farm will be worked from Hagari and will be used to produce seed for distribution.

4. *Staff.*—Assistant Farm Manager W. Raghavachari was in charge of the farm until 3rd April 1911 when Assistant Farm Manager V. S. Subramania Sastri took charge in which he continued until the end of the year.

The Nandyal Agricultural Station.

Season.—The season was favourable for cotton and fair for sorghum and on the whole better than last year though the rain fall for the year was only half that recorded for last year. Sorghum grew very well until the middle of October and had there been a fall of two inches towards the end of that month, it would have yielded satisfactorily and there would have been very little in the season to complain of.

Crops—Sorghum.—This crop was sown out over an extent of 11¼ acres this year and as stated above the yields were fair, better than last year when the rains were untimely and in excess of the requirements of the crop, the average acre-yield this year being 420 lbs. grain and 1,920 lbs. of straw as against last year's yield of 247 lbs. of grain and 1,113 lbs. of straw.

Selection work in this crop has been begun but as yet there is nothing to report.

Cotton.—18·75 acres were put down under this crop this year of which one acre was grown as a mixed crop with horsegram. The yields are satisfactory the best being obtained from selection No. 50 which on a 15 cents plot yielded at the rate of 470 lbs. of kappas per acre. Sircar cotton in field No. 2-A on a plot of 5 acres gave an average yield of 456 lbs. of kappas per acre, this field is however the best on the farm. Selection work in this crop continues to make satisfactory progress. Samples of lint of Nos. 2, 3 and Sircar cotton were sent to Messrs. Binny & Co., Madras, who kindly tested them and reported that No. 2 was the best. As this cotton had shown itself to be the best of the selections on the farm, in point of colour and percentage (the figure this year was 31·4) it was sown out on a large plot preparatory to being distributed to the seed farms and next year 1912–1913, 100 acres will be sown with this selection and will provide a small amount for distribution in addition to sowing out the whole area required for seed farms in 1913–1914. The average acre-yield of kappas this year was 308 lbs. as against 214 lbs. last year.

Experimental work.—All the experimental plots were maintained and in addition a manurial experiment with cattle manure was laid down.

Seed distribution.—The following quantities of seed were distributed during the year :—

	lbs.
Local cotton	34,000
Cambodia cotton	2,000
Green-manure seeds	315
Miscellaneous	1,831

Twenty-four implements mostly seed drills were supplied to applicants.

Miscellaneous.—Proposals were made to extend the farm, and these were sanctioned and an area of 45·43 acres was taken over on the southern side of the farm.

Staff.—Assistant Farm Manager T. S. Venkatarama Aiyar remained in charge of the farm throughout the year.

The Hindupur Agave Plantation.

The proposals put up in 1910–1911 to give up the plantation were sanctioned in G.O. No. 965 of the 3rd April 1911, and therefore no work was carried out during the year. The watchman was retained until October 31st, 1911 and the plantation was handed over to the Revenue Department in November 1911.

G. R. Hilson,

15*th May* 1912. *Deputy Director of Agriculture, Northern Division.*

Administrative Report of the Deputy Director of Agriculture, Southern Division.

I have the honour to forward the administration reports of the agricultural stations under my charge for 1911–1912. The district work in connection with each agricultural station is also mentioned in these reports.

2. I took charge of the southern division from Mr. Sampson on the 22nd of April 1911 and with the exception of two days which were spent on casual leave, have been in charge for the remainder of the year under report.

3. During the year the work of the department has developed considerably and instances are not wanting to show that, as it becomes more widely known, it is being made use of more and more by the cultivating classes. The increase in the correspondence in my office, in the number of visitors to the agricultural stations, in the sale of seeds, all point to the fact that the department is appreciated and is extending its sphere of usefulness.

4. Six thousand five hundred and ninety-seven copies of the agricultural calendar were sold through my office during the year. The quantity of correspondence and orders for seed, which they bring in, show their value as a means of bringing to the notice of the ryot any crops, implements, improvements, etc., the value of which has been proved on the agricultural stations.

5. I was able to spend 185 days on tour during the year and besides visiting the agricultural stations and Coimbatore, was able to make district tours in the Tanjore delta, the Cauvery valley, the irrigated area of the Madura district, the black cotton soil tract in Tinnevelly and the Tambraparni valley. I also visited the farms in the Northern division. The Assistant Director, M.R.Ry. Ramasastrulu Nayudu, spent 150 days on tour during the year: much of his time was taken up in visiting the lands of private individuals in response to letters asking for advice. In this way he was able to traverse most of the division, besides which he also visited the agricultural stations from time to time.

6. Separate reports will be submitted on the cotton improvement and green-manuring work, both of which have made satisfactory progress. The area under drilled crops in Tinnevelly district this year, namely 3,605·40 acres, is greater than it has ever been before. The demand for pure kārunganni seed from the seed farms was very great. The whole quantity, 94,968½ lbs. was all disposed of very early in the season and many people who came later for seed were disappointed. The demand for pure Cambodia seed was also very large and 30,520 lbs. were sold during the year.

The receipts from the sale of green-manure seeds this year amount to Rs. 4,624–14–4 as compared with Rs. 3,680–11–8 last year.

The Palur Agricultural Station.

The Season.—The rainfall of 48·64 inches is well above the average of 44·76 inches for the last five years. During the south-west monsoon there was a long break in the rains just after dry land sowings had been completed with the result that dry land crops fared very badly. The north-east monsoon however, though rather too violent at the end of November, produced some excellent paddy crops, but proved too much for the sugarcane crop which it was impossible to drain.

Rainfed crops.—As already mentioned, the rainfed crops suffered this year from a long period of drought just after sowing. The Transvaal varieties of cumbu, the fodder cholam and the introduced varieties of maize practically failed in consequence. The cereal-ground-nut rotation experiments have however given interesting results though the cereal crops have all been poor. The advantage of growing the cereal and ground-nut crops mixed every year rather than as pure crops in alternate years has been very clearly brought out by this year of short rainfall, when cereal crops practically failed. A comparison of the results obtained during the last five years show that cumbu and ground-nut every year has given better results than tenai and ground-nut, while the plots where cumbu and tenai are grown in alternate years have given the best results of all.

Crops on garden land.—In spite of the failure of the April and May rains, the irrigated ground-nut crop was good, though the irrigation charges were heavy. Some of the varieties, now that they are becoming acclimatised, are yielding heavier crops; and the variety from Senegal has this year given a higher yield than the local Mauritius variety. Cambodia cotton, as a rotation crop for irrigated ground-nuts, last year gave a profit of Rs. 150 per acre. This year ground-nuts were grown on the same land and gave a yield of 1,754 lbs. per acre which is the highest yield obtained on the farm this year. All the seed from the cotton crop was disposed of locally for seed purposes. Several very successful crops of Cambodia cotton were grown in the neighbourhood of the farm this year and the cultivation of the crop is rapidly spreading northward into Villupuram and Tindivanam taluks. The three taluks to the west of the farm, Tirukkōyilūr, Kallakurichi and Vriddhāchalam were also visited this year by officers from Palur, leaflets on the cultivation of Cambodia cotton were distributed and orders for seed, which was supplied later from Koilpatti, were booked. It is not known yet how the crops are succeeding as it has been impossible to spare any one to visit them.

Crops on the wet land.—The sugarcane crop was this year on low-lying land which was water-logged during the north-east monsoon with the result that the crop made very little growth after November. Java seedling No. 247 is a promising variety which tillers very well and stands up even on water-logged land. Tanna blanche, though not a very high quality cane, yielded a heavy crop and is being distributed by the factory at Nellikuppam to neighbouring ryots. The area under cane this coming year is expected to be over 3,000 acres and the factory will have to enlarge their plant to deal with the increase in production. Ryots in the neighbourhood are now beginning to understand the importance of drainage to the

sugarcane crop and there were many crops this year grown on garden land under well irrigation. There were two oil-engines at work close to the farm, each irrigating about 10 acres of canes: the crops grew very tall and were expected to yield from 20 to 25 candies (of 500 lbs.) of jaggery to the acre. The factory also grew some very good crops on garden land and find that on this kind of land the crops ripen well and do not lodge as the drainage is good.

The paddy crops this year have been very good and the marked improvement in the fertility of the farm wet lands during the last few years may be seen from the following figures which give the total yields of paddy obtained on the farm during the past five years:—

Year.	Total yield in lbs.
1907–1908	21,852
1908–1909	25,760
1909–1910	25,053
1910–1911	38,528
1911–1912	40,030

The increased fertility is due to the practice of growing green-manuring crops and is not the result of expensive manures which are not within the reach of the ryot. Several instances have been given in the scientific report of this station showing the increase in yield of paddy crops produced by the green-manuring crops and there is nothing further to add to the remarks made there. As will be seen from the seed distribution statement of this farm for the year, a very large quantity of seeds of green-manuring crops have been sold and it seems likely that in the next few years the practice of green-manuring paddy lands will come into vogue largely in South Arcot district where the water-supply is good.

Seed distribution.—The total quantity of seed distributed from the farm during the year is as follows:—

	LBS.
Paddy varieties	13,960
Ground-nuts	2,888
Green-manure seeds	26,429
Cambodia cotton seeds	645
Maize seed	74
Onion seed	72
Cane setts	50,422

Staff.—The Manager spent 65 days in camp during the year in addition to which he was transferred to Manganallur Agricultural station for three months from the middle of November to the end of February to commence building operations prior to the return of Farm Manager M.R.Ry. C. Narayana Aiyar who did not return from sick leave till the end of February. The Manager toured in Shiyali taluk in May in connection with the introduction of green-manure crops and single planting of paddy. He also attended two meetings of the Kallakurichi Branch Agricultural association and sold a considerable quantity of green-manure seeds in this taluk. Assistant Manager K. Ramanatha Aiyar continued his green-manuring work in North Arcot district which was begun last year; he also toured in some taluks in South Arcot district with the same object. Assistant Manager N. S. Kolandaisawmi Pillai toured in Tirukkoyilur, Kallakurichi, Vriddhāchalam and Attur taluks in connection with the extension of Cambodia cotton cultivation; he distributed leaflets and sold 2,270 lbs. of Cambodia cotton seed while on tour. During July and August he was transferred temporarily to work in the Periyar tract. Assistant Manager K. T. Alwa joined the department on 16th January 1912 and has since been stationed here.

Miscellaneous.—The following implements were made and sold by the farm to ryots during the year:—

Scind ploughs	52
Triangular harrows	25
Improved country ploughs	13
Guntakas	4

Scind ploughs are increasing in popularity in this district for dry lands and garden lands. The deeper tillage effected by this plough has produced better crops this dry season than were obtained on land ploughed with the country plough.

The rest-house for Indian visitors was completed during the year and is now in use. One bullock died from Tetanus during the year and another was purchased to take its place.

The Koilpatti Agricultural Station.

Season.—The total rainfall of 30·76 inches during the year has been much above the 35 years' average of 25·79 inches: as was the case last year, however, the rain has been badly distributed. In the beginning of the year the hot weather rains gave promise of producing a second flush of cotton, but, just when the plants were flowering, heavy rain fell which caused the flowers to drop without setting bolls. The second picking was therefore practically a failure

The red soil crops were sown in September, the usual sowing month, after which there was a dry period of a fortnight during which the newly-sown crops were threatened with drought. However, the north-east monsoon rains came in the second week of October and continued with very few interruptions till the middle of December. In the months of October to December the rainfall was more than was necessary and was so continuous that sowings and inter-tillage were much interrupted, while the growth of the cotton crop was checked. The fodder cholam crops, however, benefitted very much from the rainy weather and throughout the district were excellent. Cumbu was not seriously damaged by the rain which had almost stopped when the crop came into flower. During the last three months of the year only half an inch of rain fell, while the 35 years' average for this period is 2·31 inches. The cotton crop has accordingly suffered and will yield little more than a pothie per acre which at the present low prices makes profits very small.

Black soil crops.—The success of drilled cumbu crops has been very clearly shown this year and all over the district they have given better yields than broad-casted crops. It is difficult to account for this fact and it might be expected that in a rainy season like the present there would be little difference between the two methods of sowing, especially as it was impossible in many cases to get the implements on to the land to intertill the crops. Selection work has this year been commenced on the local variety of cumbu and for this purpose fresh seed was obtained from Ottappidaram taluk, a tract of cumbu-growing country where a very good strain of cumbu is grown. The crop from this seed was superior to the farm cumbu and some selections have been made from it for sowing next year. As already stated, the fodder cholam crops were very good this year. The periamanjal variety which was introduced two years ago from Coimbatore has given very heavy yields of fodder and shows promise of being an improvement on the local irungu variety especially on garden lands.

Improvements.—The revetment work has this year continued on the black soil and though there is still more to be done in some fields, the heavy rains this year drained away much more quickly and did not do so much damage as in former years. During the year the implement shed and office were completed and two new coolie huts were built on the black soil. The Public Works Department also handed over the inspection bungalow to this department.

Staff.—The agricultural station suffered considerably this year from too frequent changes in the management. On 1st June 1911, Farm Manager M.R.Ry. A. V. Tirumuruganatham Pillai was transferred to Madura to take charge of the work in the Periyār tract when M.R.Ry. C. Narayana Aiyar's health broke down. M.R.Ry. M. Mangesha Rao then managed the farm until he was transferred to Taliparamba Agricultural station for two months during which time acting Manager Sankara Aiyar was in charge. These repeated changes interfered with the district work also.

Seed distribution.—During the year 12,920 lbs. of kolinji and 31,152 lbs. of Cambodia cotton seed were distributed from the farm. As all this seed had to be carefully dressed before being sent out, a great deal of the officer's time was taken up with this work. In addition to this, cumbu, cholam, onion, maize, cowpeas, coriander and other seeds were sold in small quantities.

Miscellaneous.—As the result of a cyclone on the 17th of September, the cattle shed and cooly huts on the black soil area were blown down and two bullocks were killed.

The Taliparamba Agricultural Station.

Season.—The season was on the whole favourable for the paddy and sugarcane crops, but unfavourable for the pepper and dry land crops generally. The June rainfall of 61·24 inches is the heaviest on record since 1905. At the beginning of June the monsoon broke with great violence and as a result, the paddy nurseries which were sown late on account of the failure of the hot weather rains, suffered; the heavy floods also checked the growth of the young sugarcane crop. At the commencement of the north-east monsoon there was not sufficient rain for dry land crops, while towards the end there were one or two very heavy falls which caused a great loss of pepper from shedding of spikes and "pollu" attack.

Crops.—The work has this year been chiefly confined to the following crops:—Sugarcane, paddy, pepper and dry land crops generally.

Sugarcane.—Of the varieties under trial on the farm, Barbados seedling No. 208 has given the best results and seems in every way suited to West Coast conditions. The cane grows strongly and stands up well: in addition to which it ripens well and makes excellent hard jaggery. The greatest point in its favour, however, lies in the fact that the canes do not arrow at the end of the monsoon. All the other varieties which have been under trial this year came into flower and stopped growing as the monsoon disappeared.

The red Mauritius cane which was originally distributed on the West Coast does not ripen so uniformly and consequently gives softer jaggery than the B/208 variety which is gradually replacing it.

A great deal of the Manager's and Assistant Manager's time was this year spent on tour in connection with the introduction of sugarcane cultivation. In the beginning of the year young crops had to be visited and advice given. In Malabar sugarcane is a new introduction and it is therefore very important that in the beginning the crops should be successful. At the end of the year the crops had again to be visited and arrangements made for crushing the canes and making jaggery: also whenever necessary coolies were sent from the farm to give demonstrations in jaggery-making. In addition to this, the demand for seed canes at the end of the year was very great and as far as possible every ryot who obtained setts through the farm was visited and helped in the preparation of his land and the planting of the crop. In all 127,375 cane setts were this year sold either direct from the farm or from last year's plots if one happened to be handy. From the following list showing the talukwar distribution of the setts, it will be seen that the crop has now spread throughout Malabar: —

Palghat	34,500
Ponnani	15,000
Walavanad	17,000
Calicut	6,000
Kurumbranad	15,600
Kottayam	15,750
Ernad	16,775
Chirakkal	6,750
Total ...	127,375

In addition to this, ryots have also purchased setts on their own account, but it is impossible to say to what extent. The probable area under canes in Malabar is in the opinion of the Farm Manager from 75 to 100 acres in extent. There were this year three iron mills in use on the West Coast for crushing canes, excluding the two farm mills which were in constant use throughout the crushing season. Next year, however, several private individuals intend to purchase mills and hire them out to ryots by the day. In South Malabar, the Palghat Agricultural association purchased a mill this year which was used throughout the district. The Tellicherry association also intend to buy a mill next year as the area under canes is increasing in this neighbourhood. It is pleasing to see that the agricultural associations on the West Coast are now working with the department. Not only are they stocking iron mills and boiling pans for general use, but they also placed money at the disposal of the department this year in order to defray conveyance charges on cane setts and so enable ryots to obtain setts as cheaply as possible. The Farm Manager visited South Canara this year to see how the Mauritius canes, which were introduced into this district by the department three years ago, were progressing. He reports that the Mauritius variety has given better results than the local variety both in the quality and quantity of jaggery and that it is gradually replacing it. The Manager found that nearly everywhere the old wooden mills have been replaced during the last three years by iron mills. In the neighbourhood of Mangalore, he introduced and supervised the construction of a new and economical pattern of fire place for juice boiling, by the use of which the megass and trash from the cane crop suffice for the boiling and it is unnecessary to use any other fuel in addition. While in South Canara he also received orders for 27,000 cane setts which were supplied from the farm.

Paddy.—The farm crop this year demonstrated clearly the improvement in yield that can be brought about by seed selection, single planting and the growing of green-manuring crops. The farm crop was all transplanted with single seedlings from selected seed. The nursery was thinly sown in consequence of which all the young plants were strong and healthy when transplanted. Daincha and cowgram were both grown as green-manure crops, but did not give as good a crop as was expected owing to the failure of the April-May rains. The superiority of the farm paddy both in size of grain and yielding capacity over the local crops is so marked that there is a large demand for the farm seed and the whole of the crop was disposed of locally for seed purposes. Forty-six Madras measures of Daincha seed were disposed of for green-manuring purposes partly in the neighbourhood of the farm and partly by the Manager and Assistant Manager when on tour in connection with sugarcane work. It is at present, however, too early to report on the growth of the crops.

Pepper.—But for the unfavourable weather at the end of the north-east monsoon the pepper crop would have been a very heavy one. Under the circumstances therefore this year's yield of 3,654 Madras measures is satisfactory and is the highest on record with the exception of the 1910 crop. The yields from the non-experimental portion of the garden show a great improvement during the last few years and demonstrate the importance of paying proper attention to the vines and digging the garden regularly. The young vines planted since 1906 are growing well and beginning to bear. Of the plots under experimental treatment the plot manured with lime and leaf-mould has increased in yield every year from 5·75 Madras measures in 1907 to 113·5 Madras measures this year. The vines in this plot also feel the hot weather and wilt much less than vines in other plots. Lime and leaf-mould is a cheap manure and now that its value has been proved, its use will be advocated. Of the other manures under trial, fish manure and cattle manure have given the best results.

Dry land crops.—The object of the dry land portion of the farm as explained last year is to demonstrate that permanent cultivation of dry land is more remunerative than the destructive practice of fugitive cultivation. The experiment was started in 1907 and so far the results have been successful. Our example has been followed and in the neighbourhood of the farm there are now several walled gardens to be seen similar to the dry land portion of the farm. The most successful of the crops which have been introduced is ginger. This year half an acre of land was planted with ginger and in spite of the somewhat unfavourable season, the enormous nett profit of Rs. 221–8–0 was obtained from the half acre. In the neighbourhood of the farm the cultivation of the crop is being eagerly taken up and it is impossible to meet the demand for seed. The chilly crop also gave a nett profit of Rs. 57 per acre, but this would have been more than doubled had there not been a spell of drought at the beginning of the north east monsoon. The ground-nut crop which gave so much promise when it was first introduced suffered very much this year from wild animal attack; this was also the case last year and in consequence many people have given up the crop. In certain parts of South Malabar, however, the crop has established itself and in Palghat an 8 horse-power oil-engine has been started for milling the nuts.

Staff.—The Manager has been in camp for 175 days and the Assistant Manager for 84 days during the year. Farm Manager M.R.Ry. M. Mangesha Rao was temporarily transferred from Koilpatti to take charge of the farm during the sugarcane-planting season from 3rd January 1912 to 29th February 1912 when both the Manager and Assistant Manager were in camp. Assistant Manager K. P. Sundaram Aiyar joined the department on 5th May 1911 and was stationed here till 20th June 1911, when he was transferred to the Tanjore delta. Now that the work of the department is becoming known, the touring work is very much heavier than it formerly was and the present staff of a Manager and an Assistant Manager is inadequate to deal both with district and farm work. In view of the fact that sugarcane promises to be such a successful crop, it seems advisable that a full-time Manager should be stationed on the West Coast during the next few years to supervise the cultivation of the crops and the making of jaggery which are unknown to West Coast people.

Visitors.—The farm is well known now throughout the West Coast and this year there have been a large number of visitors. Some very successful parties organised by the Tahsildars have visited the farm and been shown the work which is being done. In this way the influential ryots of seven taluks visited the farm with the Tahsildars. All the visitors were much struck with sugarcane crop and many orders were received for seed canes. The ginger and chilly crops also attracted much attention. The Manager and Assistant Manager are to be congratulated on their year's work. As will be seen from the marginal statement, they have run the farm at a profit this year, but what is more important still they have made many friends in the neighbourhood of the farm and also in other parts during their tours. The tactful and unassuming manner in which they conduct their tours and the hospitality which they show to visitors at the farm has a great deal to do with the proper understanding which now exists between the department and the ryot class on the West Coast.

Items.	Receipts.			Items.	Charges.		
	Rs.	A.	P.		Rs.	A.	P.
Sale of pepper	1,104	2	2	Purchase of live stock ..	15	4	0
Do. of ginger	137	7	3	Do. of dead stock ..	88	8	4
Do. of paddy	104	11	4	New works	174	13	9
Do. of sugarcane ..	26	13	10	Repairs and upkeep ..	181	12	4
Do. of jaggery	107	11	2	Maintenance of cattle ..	75	0	11
Miscellaneous receipts ..	221	6	1	Cooly labour	495	13	1
				Miscellaneous cultivation expenses.	183	8	0
				Seeds and plants	96	4	7
				Manures and chemicals ..	164	9	6
				Sundries	53	14	9
Total ..	*1,702	3	10	Total ..	1,529	9	3
Nett profit ..	172	10	7	....	....		

* This excludes Rs. 23-11-0, value of seed supplied free.

TRICHINOPOLY,
20th May 1912.

H. SOUTHERN,
Ag. Dy. Director of Agriculture.

APPENDIX III.

ANNUAL REPORT OF THE MADRAS AGRICULTURAL CHEMIST FOR THE YEAR 1911–1912.

I have the honour to submit herewith my annual report for the year ending March 31st, 1912.

2. Several changes have been made in the constitution of the staff during the year. After several ineffectual attempts to fill up the vacant post on Rs. 150—20—250 *per mensem* the Government sanctioned, in G.O. No. 2137, dated the 13th July 1911, the splitting of it up into

two posts of lesser pay, and M.R.Ry. P. A. Raghunathaswami Aiyangar, a Diplomate of the Saidapet College, was appointed as assistant on probation on grade Rs. 50—10—150 on 1st October 1911. M.R.Ry. B. Visvanath was appointed on probation to the remaining post of Rs. 50—10—100 on the 20th January 1912. Owing to this accession to the number of assistants the Second Assistant, M.R.Ry. P. A. Subramanya Aiyar, B.A., was relieved from the routine analytical work and was delegated on 1st October 1911 to carry on research work under my directions. It is hoped that this arrangement will lead in the future to the production of larger volume of this type of work than hitherto has been found possible.

3. During the year the following samples have been examined and reported upon--

Feeding stuffs and fodders	29
Soils	71
Well and irrigation waters	38
Sugarcane and sugarcane products	179
Alkaline soils	4
Oils and oil-seeds	46
Poonacs	4
Pati mannu	9
Fish-manure	6
Village and farm-yard manure	14
Artificial manures	8
Miscellaneous manures	22
Total	430

This is an increase of 105 samples as compared with last year and is mainly due to the larger amount of analytical work done in connection with sugarcane. The work in this direction was hampered by the fact that the additional polariscope indented for did not arrive until towards the end of the sugarcane harvest, otherwise there would have been a still greater increase in the number of analyses performed.

The number of analyses performed for persons outside the department was 103 and these consisted mainly of samples of soil and irrigation waters.

4. The work upon the black-cotton soils of India has been concluded for the present and an article is in the course of preparation for publication. This investigation was carried out in conjunction with my Chief Assistant M.R.Ry. M. R. Ramaswami Sivan Avargal, B.A.

5. The work in connection with the gases actually found in the paddy soils has been concluded, but it has been decided not to publish them at present as the problem is complicated by the fact that the gases actually evolved from the soil are different in composition and appear to have a connection with the aeration of the roots. The whole problem is closely bound up with the question of drainage in these soils, and the amount of water necessary for the crop, and pot-culture experiments have been carried out, the object of which is to gain definite information on the subject. These experiments will be proceeded with during the ensuing year.

6. Bacteriological work dealing with the decomposition of green-manures in paddy soils and other problems of a like character, have been carried out and the investigation is still proceeding.

7. The flying survey of the Kistna delta has been completed and it is proposed, during the ensuing year, to carry out a more detailed type of survey of the soils of the Tanjore delta.

8. Many analyses have been carried out relating to the composition of the crops of South India and this will be continued as opportunity arises.

9. During the year the Agricultural Chemist was on tour for 31 days and the members of his staff for 92 days.

COIMBATORE,
14*th April* 1912.

W. H. HARRISON,
Agricultural Chemist.

APPENDIX IV.

ANNUAL REPORT OF THE GOVERNMENT BOTANIST, 1911–1912.

I have the honour to forward the following report on the work done in my section during the year 1911–12.

2. *General.*—While the laboratories are now fairly well equipped, the furnishing is by no means complete. This is especially the case with the herbarium, where the new cases have not yet been supplied, and the lecture room which is still untouched. Work in all directions was continued uninterruptedly during the year.

3. *Staff, leave, etc.*—The Government Botanist was in charge throughout the year. The Head Clerk was on sick leave for six months and various other officers enjoyed short periods of privilege leave. Fieldman K. Chinnaswami Pillai was suspended in December for one year for insubordination.

4. *Government Botanist.*—During the first part of the year teaching, as usual, occupied most of the Government Botanist's time. Upon his being relieved of elementary teaching by the Board, however, he was able to devote himself to a certain amount of touring and research, as detailed below. During two periods aggregating 41 days he was in charge of the Principal's office as well as his own while that officer was on tour with the students. Sixty-four days were spent on tour. Bangalore, Taliparamba, Madras, Ootacamund, Iruttupallam and Coorg were visited as well as the Agricultural Conference at Pusa. Among special reports prepared the most important was one on the spread of *Mimosa pudica*, the sensitive plant, in Coorg. This report has now been printed in the Agricultural Journal of India. A considerable amount of time was spent in the herbarium as stated below.

Two courses of lectures were delivered, one in Elementary Botany, chiefly by an Assistant, and one on Agricultural Botany by the Government Botanist. These lectures are referred to in the report on the working of the College.

5. *Systematic Botany.*—A considerable amount of attention was devoted to this section during the year because of the decision on the part of the Government to have a flora of Madras Presidency prepared, and numerous reports were forwarded on the subject. There was practically no special touring for the collection of plants, but substantial additions were made to the collections of peppers and *Loranthaceae* by the Government Botanist while on other tours and a few local expeditions were made by fieldmen.

Much progress was made in getting the large accumulation of plants, collected in previous years by the Government Botanist, named, although this work was still hampered by lack of staff and the absence of suitable herbarium cases. Some 7,700 sheets were finally written on and added to the special collection of Madras plants. Eighty duplicate sheets were received from the Calcutta herbarium. A small herbarium of 250 species of plants was given to the Presidency College for teaching purposes and about 50 sheets were distributed to other correspondents. The whole collection of *Dioscoreas* was sent to the Reporter on Economic Products and named and returned by him. The valuable collection of *Grewias* remained with the Kew authorities throughout the year. An important addition was made to the illustrations of the Madras flora in the form of 513 pen and pencil drawings of plants. On investigation these turned out to be the originals of the plates in Wight's, Beddome's and other authors' published works on the Madras flora. They were received in an extremely dilapidated condition but every effort is being made to preserve them in a series of specially prepared atlases. About 200 plants were named by the Assistant for various correspondents. The collection of 1,143 sheets of Madras peppers was overhauled by the Government Botanist and numerous dissections and drawings made. The specimens were sorted, arranged and named where possible and notes were drawn up for the information of the writer of the flora. A summary note on this work was prepared and forwarded for filing at Kew. The seed collection was overhauled and it was found necessary to reject a large number on the ground of insufficient naming. About 280 new species were however added so that the number at the end of the year was 600.

Numerous notes and reports were prepared during the year, the following being most important:—

Toddalia aculeata and Erythroxylon coca for the Separate Revenue Department, the cultivation of coca and drought-resisting Fodder Plants for the Director of Agriculture, Tropical Eucalypts for the Kistna Agricultural Association, Archids on the Nilgiris for Mr. Ateam, Australian timber trees for the Engineering Department, etc. A short article was prepared on the Chingleput flora for the officer compiling the Gazetteer.

6. *Economic Botany.*—The work in this section varied a good deal at different periods, partly according to the plants growing and also partly to the amount of time available from teaching work.

Cotton.—In the early part of the year careful analyses were made of the seed and lint characters of the second generation of crosses raised in the botanical garden, this study involving the thorough examination of some 400 plants. An interim crop was raised in baskets and then planted out, but of the 900 plants thus treated most failed to mature, owing to a severe outbreak of stem-weevil and the unseasonableness of the weather. Mendelian work on them was therefore impossible. The main crop was then sown at the usual time but here again the growth was so poor that the study had to be abandoned. Considering the disastrous effect of the stem-weevil upon Cambodia plants grown in the neighbourhood of Coimbatore it is of interest to record that the Spence plants grown in the Botanic garden appear to be more or less immune to this pest. Further, a cross between Spence and Bourbon raised in the garden has the same character and was able to overcome the attacks of stem-weevil while the Bourbon, like the Cambodia, succumbed. It is worth while considering whether an infusion of Spence blood into the ordinary Cambodia may not be of use if the latter variety continues to be seriously threatened by this new pest.

Some dark brown-coloured Cambodia kappas received from Tiruppur was sown with the main crop after analysis. Although the plants suffered much as the other cotton plants there is sufficient evidence to make it certain that this form is a cross and not a natural sport as at first seemed probable.

Some interesting hybrids having been observed among the exotic cottons grown at Palur Farm an assistant was sent down to examine them. From his study it appears that the parents of the crosses were Sea Island and Cambodia. The necessary instructions were drafted or the collection of seed and the further examination of these interesting plants.

Some further desultory work was done in cottons for various correspondents and the root systems of Uppam and Cambodia were dissected out and photographed.

Hibiscus Cannabinus (*Gogu*).—Six forms obtained by previous Mendelian work, including the red-entire-leafed form which had been built up in the botanic garden, were planted out for testing the yield and quality of the fibre. Like other plants sown however the growth was very poor and the work will have to be done again for a satisfactory test. A set of plots were sown for the use of the students and formed one of the practical illustrations in the course on Mendelism.

Red-gram (*Cajanus indicus*).—The farm varieties separated in previous years were again sown and analysed, special reference being made to yield, age of maturing, cooking and tasting qualities. Selected seed was reserved for next year's sowing.

Colour estimation.—Owing to the importance of correct estimation of shades of colour in Mendelian work a careful study involving hundreds of observations was made of the tintometer lent by the Agricultural Chemist.

Sugarcane.—After the Pusa Conference and commencing with the Christmas holidays, all spare time was devoted to this subject. Two main lines were studied, the raising of seedlings and the botanical differences of the mature canes.

Seedlings.—These had not hitherto been successfully raised in India and there was thus nothing to go upon in the work. Most of the cane arrows at Coimbatore were too old for use, but a series of expeditions to neighbouring villages produced a fairly large number belonging to six or seven varieties. A careful search was first made in these for fertile seed, but after a month's study only one "probable" seed was found. The reason for this infertility was the problem next attacked. Stigmas were observed on many arrows to see if pollen grains were to be found attached to them, and then the pollen sacs were themselves studied. It was found that in the great majority of cases the pollen was undeveloped and the anthers were unopened. Arrows were then collected from the United Provinces, Mysore, Malabar, South Arcot and Samalkota. In some of these (Mysore and Taliparamba) and in others from local sources a few varieties were found which habitually open some of their anthers. Arrows were at once sown from these varieties and a fair number of seedlings were obtained, but it was too late then to do anything on a large scale. Altogether 300 pans of arrows were sown and examined day by day. The raising of seedlings was found to be deserving of quite a special study and the difficulties, chiefly climatic, were one by one surmounted. But of the 70 seedlings obtained in February only 17 have produced strong healthy plants. A later consignment of arrows produced a much better result and it is hoped that about 40 seedlings will be available on the first year's work. With the knowledge gained it may be anticipated with some confidence that as many seedlings can be raised next season as can be dealt with.

Botanical characters of canes.—Thirty varieties of Bengal canes and 5 from the United Provinces arrived before the close of the financial year. The number has now been increased from Mysore and various parts of Madras to 93 and these have been submitted to a careful scrutiny, drawn, photographed and planted in the botanic garden. The synonymy of the Madras canes has been attacked and several interesting discoveries have already been made.

Horticulture.—Most of the spare time in the early part of the year was spent in working out this subject for the benefit of the students, for it was soon found that the methods and descriptions in European text books were quite unsuited to the local conditions. Special attention was devoted to pruning for growth and fruit. The guava was selected for detailed study and as the result of this, it was found possible for the class to prune a tree which had never borne fruit but which, after this treatment, produced nearly 100 guavas. A great number of photographs were taken showing the results of different kinds of pruning and these have been added to the College collection.

Root-systems.—The dissections of root-systems commenced last year was continued. The neem tree (*Melia azadirachta*), portia (*Thespesia populnea*) and babul (*Acacia arabica*) were added to the list of trees and a large number of field crops were also dissected out and photographed.

Seed testing.—During the year about 150 samples were tested for germination capacity. Besides this ordinary routine work, the seeds of a dozen selected crops were tested and stored in various ways. These are to be again tested every six months in order to obtain some data as to the longevity of ordinary Indian crop seeds and the best methods of keeping them. No work on this subject appears to have been done in India.

7. The botanic garden was maintained and improved in various directions. As before, he want of water was severely felt but some improvements were made in irrigation facilities. The garden is, generally, increasing in beauty and attracts a large number of visitors. During the year 1,192 plants, seed packets, etc., were distributed and 478 received.

The main use of the garden has been to provide specimens for the Botanical laboratory and demonstrations in horticulture. Grafting, layering, pruning for growth, flowers and fruit, root development, etc., formed the subjects of classes in Agricultural Botany and a large number of descriptive labels were put out to assist the students.

Plots of cotton, gogu (*Hibiscus Cannabinus*), castor, mulberry and red gram (*Cajanus indicus*) were grown for experimental work and the collection of sugarcane varieties and seedlings have a temporary home there. A plot of English potatoes was put down, but too late in the season. The growth was good but the outturn was small. It is proposed to plant the crop earlier this year.

The fruit garden continued to receive attention. Figs, grafted guavas and papaws were an unqualified success and cherimoyas (*Anona cherimolia*) and pomegranates fruited. The varieties of plantains were grown chiefly as a wind-break and produced a large number of bunches. The grafted mangoes have not as yet done well. Many of them were attacked by fungus disease which was traced to the nursery from which they came. While a few of the citrus collection have become established, it has been found difficult to grow this class of fruit tree. The vines also have not done well but are gradually improving. It will probably take some years before the land is made suitable for these latter.

The Eri House was kept up with a succession of broods and was used to the full for demonstrating ericulture, while a small experimental brood of mulberry silk worms was also reared, as described below.

8. *Entomology.*—This section was, as usual, under direction of the Government Botanist, but he was assisted throughout by the Imperial Entomologist. Mr. Fletcher visited the college towards the close of the year.

Besides teaching and drafting replies to enquiries of correspondents, the Chief Assistant devoted special attention to silk worms. Seven broods of Eri worms, each 10,000 in number, were successfully reared in the eri house in the botanic garden. A couple of boys, a fieldman and two men from the mufassal (one from South Canara and one from Mysore) were trained in the work. A short leaflet was prepared on ericulture and a show case made for Agricultural Exhibitions. Consignments of prepared cocoons were sent to Messrs. Binny at the Buckingham Mills, the Basel Mission factory at Calicut and the Wesleyan Mission at Karur to see if the produce could be used in Madras and a market obtained. The results were however unsatisfactory, none of these being able to work up the produce, and at present there is no market in South India for this class of silk. A small experimental brood of mulberry silk worms was raised in the eri house. The seed was obtained from the Tata silk farm at Bangalore but the resulting outturn was very poor, only 200 cocoons being raised from 1,500 eggs. On investigation at Pusa, the eggs were found to be pebrinised. The growth of several kinds of mulberry in the botanic garden was on the other hand perfectly satisfactory. The Assistant spent a large portion of his time in accumulating materials for a bulletin on sericulture in Madras, paying long visits to the chief centres in Kollegal and Berguai. This material has been handed over to Mr. Fletcher. A serious outbreak of stem-weevil on Cambodia cotton appearing in the neighbourhood was carefully investigated and most of the life history of pest worked out. As the position of Cambodia cotton in the neighbourhood is threatened by this pest its full investigation is being pushed on.

The Second Assistant was engaged in touring in the northern half of the Presidency. His chief work was the further investigation of the Deccan grasshopper outbreak in the Ceded districts. The main results of his work, which have been fully reported elsewhere, may be summarised as follows. The hopper trap which had given good results in the previous year was considerably improved and did effective service against the young hoppers. But it was found to be too expensive for the ordinary ryot's use and had to be abandoned on that account. Bags of the Mysore pattern used by Dr. Coleman were tried side by side with the trap and on the whole proved satisfactory. They are considered to be more useful than the tin trap because of their comparative cheapness. Ploughing for the destruction of the egg masses was continued at various times and in various circumstances. Considerable difficulty was experienced in this matter because the ground was usually so hard when first freed from the crops, and no definite conclusion was arrived at. The last ploughing experiments were made in January of this year and the results will be investigated later on. Considerable progress was made in the further study of the life history of the pest, especially as to its natural enemies.

The Third Assistant was deputed to make a general investigation in the southern districts of the insect pests on the crops. He visited about 20 taluks and his collections were worked out at head-quarters. Wherever possible these officers gathered the ryots together and demonstrated simple means of combating the pests.

9. The Artist, besides a variety of desultory plan and map drawing, prepared 38 diagrams in pen and ink for botanical and 12 for zoological and entomological class work. Our collection of lecture illustrations has thus been considerably increased. Hardly any of the diagrams used for teaching in temperate regions are of any use in Madras.

COIMBATORE,
1*st June* 1912.

C. A. BARBER,
Government Botanist.

APPENDIX V.

ANNUAL REPORT OF THE MADRAS MYCOLOGIST.

I have the honour to submit my administrative report for the year ending 31st March 1912. I remained on duty throughout the year as did also my Chief Assistant and Plant Collector. In July M.R.Ry. T. R. Ranganath. L. Ag., a diplomate of the Coimbatore Agricultural College, was appointed as Second Assistant and is now undergoing training. Three fieldmen's posts and an artist's post were also created and have been filled up. The artist, however, resigned on March 1st and the post is temporarily vacant. The fittings of the laboratory in the Agricultural College are well advanced and much of the apparatus and many of the books have arrived.

During the year I toured for 117 days, half of this time being spent in Gōdāvari and Kistna districts. Other tours were made to Coimbatore, Nilgiris, Malabar and Tinnevelly and I was present at the annual meeting of the United Planters' Association of Southern India at Bangalore. My Chief Assistant was on tour for 103 days and the new Assistant for 38 days.

This year again the bud-rot disease of palmyras has claimed most of my attention. The infected area in Kistna district has been considerably lessened, but that in Gōdāvari district is almost the same as it was last year. Attention has been paid to cases in which the death of the central leaf is not the first ordinary symptom of disease, but in which rows of characteristic spots on the expanding green fan of the leaf is the first sign. As the segments of the leaf protruding from the bud open out, the fungus on the spots produces spores which are in a good position to be blown to other palms. Such palms live as long as 3½ years in this state before the growing point is killed. They form about 2 or 3 per cent. of the palmyras that become diseased. They are not being cut and burnt during the course of the operations, yet they act as "carriers." A proposal has been made to introduce legislation with a view to have them dealt with. A note on the subject has been sent to the Agricultural Journal of India. The investigation of the methods by which the disease is spread is progressing. There is no doubt but that the principal ways are by human agency, insects and the wind: other agencies, as birds, are occasional and fortuitous.

An examination was made of palmyras in the southern part of the Nanguneri taluk in Tinnevelly district. It was found, however, that they were suffering not from disease but from a succession of abnormally dry seasons.

In Ponnani taluk, South Malabar, spraying of areca nuts against Koleroga disease was demonstrated to the garden owners. They are willing to have the spraying extended this year before the break of the rains and two others have written to ask that spraying may be done in their gardens. As the cost of spraying is very small compared with the gain expected it is likely that the operation will be successfully introduced here.

The help given with the set selection of sugarcane against red-rot was continued at Coimbatore and Samalkota. Successful inoculations with sugarcane smut were got at Samalkota and this investigation is being continued.

The field works on paddy smut this year lead to no results. It will be repeated.

A copper sulphate steep has been found an efficient and cheap remedy for smut on cholam. The cost per acre is only about one anna. My Chief Assistant is continuing the work on infection and problems connected with it.

A wilt on Sunn hemp grown for green manure was studied and a Fusarium isolated. Inoculation experiments are in progress to test whether this fungus is the cause.

Twenty-four parcels of diseased plants were sent for advice as to how to treat the diseases. This is a small number but it shows that people outside the department are beginning to take advantage of this section and I hope the number of references will greatly increase in the future.

Specimens of 56 fully-named fungi were added to the herbarium. Seventy-six more are named to the genus and with the help of the recently acquired copy of Saccardo's Sylloge the specific names are being worked out.

A short course on plant diseases was given to the second-year students.

COIMBATORE,
16*th April* 1912.

W. MCRAE,
Madras Mycologist.

APPENDIX VI.

REPORT OF THE HONORARY DIRECTOR OF FISHERIES, CHEPAUK, FOR 1911–1912.

Brief report on Inland Piscicultural work.

The fishery work on the Nilgiris during the financial year 1911–12 has progressed satisfactorily, all the suitable rivers being stocked with *Salmo irideus.*

The upper section of one of the streams on the Kundahs (Billiter Halla) is stocked with *Salmo fario* and the section below the falls with *Salmo irideus*; both of these have done very well.

The fishing was opened last year on the following rivers, viz., Pykara, Krurmand, Avalanche and Emerald Valley; and the largest trout taken weighed 5½ lbs. This year the lower section of the Billiter Halla, *i.e.*, from immediately below the falls just above where the Bangi Tappal road crosses the stream down to where it joins the Bhavani, will be opened for fishing in addition to the above rivers.

The Lawrence Asylum Lake and Tiger Hill Reservoir will also be opened.

2. The rivers below the Nilgiri slopes, viz., Bhavani and Moyar, the upper reaches of which have been under conservancy for the past few years, are beginning to show the benefits. During the year, I inspected these and found the fish supply to be exceedingly good, compared to what it used to be. Independent evidence as to increased catches of the fishermen lower down on these rivers was given to the late Inspector Mr. Loulie.

I am confident that in a few more years the rivers in question will have recovered from the serious depletions which were carried on from time to time by illegal methods, viz., fixed engines, destruction of spawners on the shallows, wholesale destruction of fry in the upper waters by fixed fine mesh basket traps, use of dynamite in the deeper pools, etc.; all of those destructive methods have been stopped.

Cauvery conservancy.

3. The annual beat below the Hoginkal Falls on the Cauvery river, which has been going on for many years, has received my attention and the use of dynamite in the deep and narrow channels below the falls where the fish are driven to, has been stopped so that the great destruction of fish life has to a large extent been prevented.

I find that the actual men engaged in this beat as well as the wholesale poaching on the Bhavani and Moyar, which used to take place each year, are not the professional fishermen, but a varied collection who travel considerable distances to operate on these rivers when they are low, and the fish are easy to destroy—especially when a large number of men combine.

Fish farming.

4. A fish farm has been designed and constructed at Sunkesula, Kurnool district.

The object of the farm is —

(1) To deal with and re-stock the waters of the district each year by breeding, either artificially or naturally under protection, the more valuable of the Indian indigenous fish.

(2) To demonstrate breeding for market purposes.

(3) To rescue large numbers of immature fry from the rivers and canal, when all waters subside, keep and grow until the dry season is over. This is a most important function of the fishery as these fry which range from 1 to 3½ inches, when rescued from certain destruction on the waters drying, have over three months' growth under protection at the farm. When they are turned loose in the canal, they have attained such growth as to be better able to protect themselves and form an immense additional food value.

The buildings are not quite complete, but I am pleased to say the breeding arrangements, stock and fry ponds have been in use for some time. A valuable lot of breeders are kept in stock at the farm.

Since operations began the ova of the *Ophiocephalus punctatus* have been successfully dealt with and their life history is being worked out.

Special appliances for artificial hatching and rearing of the fry have been designed and constructed.

Experiment in transport of above eggs, minute fry, as well as the mature fish are being carried out, and when complete will be a valuable asset for breeding for market purposes.

Contrary to what has been generally understood the eggs of the *Ophiocephalidæ* are not demersal but float.

The nests are mostly constructed in reeds where a circular clearing is made by the fish by biting the reeds short and compressing them; this prevents the eggs from being blown away or distributed by the wind. Alongside the nest a small tunnel is generally formed by the fish bending the reeds over, and this is used for keeping guard as the eggs and subsequent fry are under parental care.

Both during the egg stage and after hatching great destruction goes on in nature by frogs and aquatic beetles, etc., the former are generally accounted for by the parent fish, but the loss from the period of extrusion to the fingerling period is very great.

The little fish after hatching remain floating until the yolk sac is nearly absorbed excepting periodical excursions like mosquito larvæ downwards a few inches and back again to the surface. After the yolk is absorbed they feed about the nest and a little later they move amongst the reeds but constantly under parental control.

Hilsa operations.

5. Some three years ago a "hilsa hatchery" was constructed at the Lower Anicut on the Cauvery, consisting of Macdonald jars and appliances. A great number of eggs were dealt with under most difficult conditions. A large number of fry were turned out in the most suitable waters obtainable in this river with access to the sea, and several hundred thousand fertilised ova were transported to the Ponnani river on the West Coast. As I had to rely on manual labour for pumping to work the hatching jars and this failed on several occasions generally during the night, a large number of ova were consequently destroyed, necessitating all the work over again.

The fishermen caused inconvenience by refusing to bring fish for stripping and fertilising purposes and by mutilation causing blood to enter the ovaries rendering the eggs useless.

Owing to these combined difficulties I had to close the hatchery down. The introduction of hilsa to the West Coast rivers will eventually open up a very valuable and important fishery and as there are no anicuts on the rivers, the fish will have free access to their spawning grounds.

The result of transport of the eggs to the Ponnani river over two years ago cannot be ascertained for certain until the third year, as they remain in the sea for two to three years, two year olds only occasionally entering the rivers. One remarkable fact which holds out great future hope is the capture of a two-year old hilsa at the mouth of the Ponnani river.

I have now selected another ground for hilsa operations on the Kistna and Gōdāvari rivers. The hatching apparatus I am proposing to construct on a boat which will be able to work both of the above rivers and utilise the Collair Lake (which is accessible from either river) as a fry growing ground.

6. The other work carried out by this department is the stocking of tanks, inspection of sites and drawing up plans for live fish market and fish farm for Nellore district, etc. Experiments with mosquito larvæ destroying fish are being carried out and information given to the medical authorities.

Marine Pisciculture in Madras.

In accordance with G.O. Press No. 3168, Revenue, dated 28th October 1911, and with your letter Dis. No. 540, dated the 2nd November 1911, I have the honour to submit the following summary of the progress of Marine Pisciculture in Madras Presidency during the past year 1911–12.

2. The work done has consisted in the main of—

(*a*) A continuation of the experimental culture of edible oysters which was begun in Pulicat Lake in 1910.

(*b*) The compilation of a practical guide to marine fish-farming as practised successfully in France and Italy.

(*c*) A survey of backwaters, creeks, and swamps on both the East and West coasts of the Presidency with a view to select sites and formulate a working scheme for the inception of marine fish-farming on a scale sufficiently extensive to demonstrate conclusively whether this work is economically suitable under Indian conditions.

(*d*) The preparation of a scheme for the creation of a breeding reserve of pearl oysters on the Tinnevelly coast and the elaboration of a method for the artificial inducement of pearl formation.

3. *Oyster culture.*—The experiment has so far been a marked success; the attachment of spat upon various forms of spat-collectors has been on a satisfactory scale and from these it is apparent that the principal spatfall occurs during the hot weather from July to September inclusive. Oysters derived from the spatfall of 1910 are now sufficiently advanced to warrant being put upon the market during the present year 1912. The experience gained during the past eighteen months has shown that the principal species of oysters found in Madras waters is readily amenable to very simple methods of culture; the experiments were begun with a considerable amount of elaboration of detail; one by one simpler methods were successfully substituted. The practice as now followed is extremely economical and is capable of meeting an extensive demand while still maintaining large breeding reserves and an ample supply of young stocks.

4. *Marine fish culture.*—Fisheries Bulletin No. 6 which was issued in 1911 contains an exposition of the methods of fish-farming pursued at Arcachon in France and at Comacchio in Italy. In consequence of this report, the Madras Government desired that a suitable site for a fish-farm should be selected and plans and estimates drawn up. Representative backwaters and creeks in all the maritime districts were inspected and as a result, plans and estimates for two farms aggregating about 160 acres in area in the neighbourhood of Tuticorin have been submitted to Government for consideration. The estimated non-recurring cost of this scheme amounts to Rs. 4,410.

5. Considerable interest in the methods of fish-farming was aroused at several of the centres visited, and has resulted in the application for a concession of a site in Sonapur backwater, Ganjām district, the applicant agreeing to observe the instruction of the Fisheries Department in the laying out and conduct of the farm. Government have been recommended to grant the application.

6. *Pearl oysters.*—The continued and absolute dearth of pearl oyster spat on the Tinnevelly pearl banks has again prevented the carrying out of cultural work. A scheme has, however, been worked out whereby on the discovery of the next extensive spatfall an attempt will be made to protect a small bed of these young oysters until they reach maturity, with the object of creating a breeding reserve. If the method should prove even moderately successful it is proposed to extend it with a view to effect the eventual replenishment of the beds and the resuscitation of an industry formerly exceedingly profitable to the coastal population of the Tinnevelly and Rāmnād districts.

7. *Pearl inducement.*—Experiments in the artificial inducement of free or orient pearls carried on by the writer has given satisfactory initial success; work is now at a standstill for want of suitable material for further experiments. Several perfectly spherical and highly lustrous pearls have been obtained by the process employed, but the time given them to develop was too short to admit of growth beyond minute dimensions.

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Board of Revenue (R.S., Sur., L. Rds. and Agri.), No. 396, dated 30th July 1912.

F. C. PARSONS, Esq.

Read—the following paper :—

Letter—from G. A. D. STUART, Esq., I.C.S., Director of Agriculture, Madras.
To—the Secretary to the Commissioner of Revenue Settlement, Survey, Land Records and Agriculture.
Dated—the 10th July 1912.
No.—Dis. 1566.

I have the honour to submit my report on the operations of the Department of Agriculture for 1911–1912.

Resolution—No. 396, *dated* 30*th July* 1912.

The Board begs to submit to Government the report of the Director of Agriculture on the operations of the Department of Agriculture for the year 1911–1912.

2. *Staff.*—Mr. M. E. Couchman, I.C.S., who held charge of the office of Director of Agriculture since the reorganization of the Agricultural Department in 1905–1906, finally severed his connection with it and proceeded on one year's furlough on the 9th August 1911 and Mr. G. A. D. Stuart, I.C.S., was appointed Acting Director of Agriculture. Mr. H. C. Sampson was, on return from leave, placed on special duty for conducting a cattle survey of the Madras Presidency. The period of special duty was originally fixed at three months but was subsequently extended to 8 months. Mr. H. Southern, Probationary Agriculturist, was in charge of Mr. Sampson's Office from 22nd April up to the end ofthe year. M.R.Ry. D. Ananda Rao Garu, Assistant Director of Agriculture, Northern Division, was confirmed in his appointment with effect from 18th January 1912. His headquarters have been changed from Samalkota to Rajahmundry. M.R.Ry. K. Ramasastrulu Nayudu Garu, Assistant Director, Southern Division, is still on probation pending his passing an examination in a vernacular language. The post of Entomologist referred to in the last year's review has been filled up by the appointment of Mr. T. B. Fletcher, Supernumerary Entomologist at Pusa. He joined duty on 24th April 1912, that is, after the close of the year. The minimum pay of Assistant Farm Managers was raised from Rs. 25 to Rs. 35 during the year, with the result that six out of the seven vacancies in the grade have been filled up. The sanction of Government has just been received for the creation of seven more posts in the second grade of Farm Managers, and the Board shares the hope expressed by the Director that, with the increased staff, the work of the department will expand in every direction in the future.

3. *Agricultural stations.*—During the year under review, two new Agricultural Stations were sanctioned, one at Anakapalle in the Vizagapatam district and the other at Manganallur in the Tanjore district. The land required for the latter farm

is to be leased from the owner for a period of seven years and regular work is reported to have commenced with the current year. The land required for the former has not yet been acquired and handed over to the Agricultural Department. On the other hand, three of the old farms were ordered to be abandoned, viz., those at Hindupur, Bezwada and Bellary. The season was favourable at the central farm, Nandyal and Samalkota.

Sugarcane.—The area under red Mauritius near Nellikuppam in the South Arcot district continues to increase. The sugar industry in South Arcot is stated to be on a firm basis and capable of great expansion. In Malabar, the red Mauritius is being replaced by Barbados No. 208 which is stated to be better suited to West Coast conditions. Ryots are taking great interest in the manufacture of jaggery by means of iron mills.

Ground-nut.—This crop gave much promise when it was first introduced into Malabar. But it has suffered so much from the ravages of wild animals that it has received a set-back. The crop has, however, established itself in some parts of South Malabar.

Cotton.—Work on the lines described in previous years' reviews continues and it is gratifyng to see that the improvement in the quality of karunganni is still maintained. Efforts are also being made by the Agricultural Department to improve the quality of this crop in Kurnool and Bellary, where the work will be greatly expanded during the current year. It is expected that a marked effect on the general crop of these districts will soon be visible, and the Board hopes that this expectation will be realised.

Paddy.—The efforts in the direction of popularising single-seed planting have been encouraging and the practice of single planting is spreading rapidly, specially in the southern districts of Tanjore, Madura, Tinnevelly, South Arcot, Coimbatore, Malabar, and Chingleput. The adoption of reduced seed-rate throughout the Presidency will, the Director calculates, result in an enormous gain to the ryots. The Board has recently instructed all Collectors to furnish the Director of Agriculture with statistics of the area cultivated under this system, and it is hoped that accurate data will be forthcoming in the future showing the extension of the area cultivated in this manner.

Green manuring.—The interest aroused in the cultivation of this crop continues. The Agricultural Department has been endeavouring to supply a sufficient stock of green manure seeds. The demand for them is said to be heaviest in Tanjore and Madura. The prices at which the seed is sold by the Agricultural Department are so fixed as to realise a profit of about 10 per cent. over the market price, thus leaving room for private enterprise.

Sericulture.—The attempt made at Coimbatore to raise a small experimental brood of mulberry silk-worms proved a failure, the eggs having been pebrinised. Similar efforts made with eri silk worm proved successful. The Director considers that the weaving and spinning of this silk can be established as a cottage industry in this Presidency, and all that is wanted therefor is the opening of a small spinning and weaving factory at a suitable centre.

4. *Agricultural Instructions at the College of Agriculture.*—The second batch of students admitted in 1909 completed their three years' course at the end of the year under report. Ten students obtained the diploma out of the 12 that went up, while 14 passed out of the 16 second-year students who were examined for the diploma. These results were reported to Government and they were pleased to endorse the Board's opinion that these results were highly satisfactory. The proposals referred to by the Director of Agriculture in the concluding portion of paragraph 8 of the report have been submitted to Government.

5. *Non-official visitors to the College.*—The Director states that only three visits were paid by non-official visitors to the College during the year under review. The term of appointment of the honorary visitors having expired, fresh appointments have been made by Government. The appointments are for a period of three years, and the Board hopes that greater interest will be evinced by these gentlemen in the work of the College.

6. *Agricultural Associations and Exhibitions.*—Cattle shows were held at Ongole and Tiruppur during the year. Mr. Stuart does not wholly share the views of his predecessor as to the lack of practical value of these shows, but is of opinion that the shows just mentioned which he has attended appear to have some practical value. The only Agricultural Associations which appear to take an active interest in their work are, according to Mr. Stuart, those of Kumbakōnam, Malabar and South Canara and possibly Ganjām. The rest, he says, are extinct or almost so. Like his predecessor, Mr. Stuart despairs of getting any good out of these associations and considers that their constitution proceeded on wrong lines from the beginning. The proposal made by Government in the matter of combining these associations with co-operative societies was referred by the Board to all Collectors, the Director of Agriculture, and the Registrar of Co-operative Societies. Replies have been received from all officers except the Registrar, and the Board's reply to Government will be submitted on receipt of his report.

7. *Meteorology.*—The rainfall registered at the various rain-gauge stations in the Presidency was tabulated as usual and the results published by the Meteorologist, Madras, and Deputy Director of the Madras Observatory. The total number of stations in the Presidency at the end of the official year 1911–1912 was 473 inclusive of 82 in the Native States and Coorg against 472 at the end of the previous year, and of these 399 stations were inspected.

8. *Statistics.*—The following returns were published in connection with local enquiries under provincial direction: (1) Monthly season reports in three sections, rainfall, cultivation and prices of food-grains and salt; (2) annual crop forecast reports in respect of cotton, paddy, ground-nut, indigo, sugarcane, castors and gingelly; and (3) two half-yearly reports of cattle mortality.

(True Extract.)

S. VENKATARAMADAS,
Secretary.

To the Secretary to Government, Revenue Department.
,, Director of Agriculture.

II

Proceedings of the Board of Revenue (R.S., Sur., L. Rds. and Agri.), Mis. No. 2678, dated 5th August 1912.

The Hon'ble Mr. F. C. PARSONS.

Read—the following paper:—

Letter—from H. C. SAMPSON, Esq., Director of Agriculture, Madras.
To—the Secretary to the Commissioner of Revenue Settlement, Survey, Land Records and Agriculture.
Dated—the 28th July 1912.
No.—Dis. 1701.

I have the honour to enclose copies of the Honorary Director, Madras Fisheries' review of the working of that department during the year 1911–12.

Details of the work done during the year have been printed as Appendix VI to the Administration Report of the Agricultural Department forwarded with this office letter No. 1566, dated 11th July 1912, and I have the honour to suggest that the Honorary Director's review may be printed as a continuation of paragraph 23 of the Director of Agriculture's report prefaced as follows:—

The following is Sir F. A. Nicholson's, the Honorary Director, Madras Fisheries, review on the working of his department for the year.

Resolution—Mis. No. 2678, *dated* 5*th August* 1912.

Submitted to Government in continuation of Board's Proceedings No. 396, dated 30th July 1912.

(True Extract.)

S. VENKATARAMADAS,
Secretary.

To the Secretary to Government, Revenue Department.
„ Director of Agriculture.

Order—No. 2478, Revenue, dated 17th August 1912.

Miscellaneous.

Recorded.

2. The Report on the Operations of the Department of Agriculture during 1911–12 has been submitted by the Board of Revenue with commendable punctuality. The report is full of interesting information and contains for the first time a review of the valuable work done by the Piscicultural department under Sir F. A. Nicholson. The Government are pleased to note the steady advance made in popularising and extending to tracts where they were before unknown the adoption of practices such as the purchase of fresh improved seed, of economy in the use of seed, growing green manure crops and adopting suitable rotations, which cannot but be of immense benefit to the agricultural community. Indeed the Director estimates the saving in seed alone which would result from the universal adoption of single planting of paddy at a crore of rupees *per annum*. Considerable success has also been achieved in spreading the cultivation of sugar-cane and the local manufacture of jaggery by the use of iron mills, and in improving the quality of cotton and stimulating the spread of cultivation thereof in Tinnevelly, Kurnool and Bellary.

3. Sanction was accorded to the opening of two new agricultural stations—one at Manganallur in the Tanjore district and the other at Anakapalle in Vizagapatam. On the other hand, the agave plantation at Hindupur and the Bezwada agricultural station were closed during the year and the Bellary agricultural station has since been ordered to be abandoned owing to the infertility of the soils and their unsuitability for experimental purposes. Much valuable work was done at the other agricultural stations and these continue to attract a large number of visitors, while the growing volume of correspondence and enquiries is a further gratifying indication that the educated cultivating classes are beginning to realise the advantages and utility of the department.

4. Ten out of twelve students of the College of Agriculture obtained their diplomas in the examination held in March 1912. The results at the examinations have been highly satisfactory. The proposals referred to by the Director for a revision of the college curriculum and for avoiding the wastage that at present occurs in the classes during the college course are now separately under the consideration of Government.

5. Research and experiments were conducted in chemistry, botany, entomology and mycology. The Government Mycologist was engaged with the budrot disease of palmyras in the Gōdāvari and Kistna districts and the Government are glad to learn that the disease has appreciably abated in the Kistna district. The Government consider that Mr. Harrison's researches on the gases evolved from land occupied with paddy crop will be very interesting and they await the publication of the results of these experiments. The want of a whole-time Economic Botanist continues to impede the work of the department.

6. The Government regret to note the lack of public interest in cattle shows of which only two were held during the year under review as against nine last year. They observe however with pleasure that the agricultural associations on the West Coast are co-operating with the Agricultural Department in endeavouring to enable the ryots to profit by the improvements effected by the department. Elsewhere these

associations appear to be defunct or in a moribund condition. The question of their working came recently to the notice of Government and orders have been passed in G.O. No. 2677, Revenue, dated 2nd September 1911, on the future constitution of the Central Agricultural Committee and of District Agricultural Associations. A report is shortly due to Government on the proposal to combine these associations with Co-operative Credit Societies.

(True Extract.)

L. M. WYNCH,
Ag. Secretary to Government.

To the Board of Revenue (Revenue Settlement).
„ K. T. B. Tressler, Esq., Superintendent, Industrial Education.
„ the Educational Department.
„ the Local and Municipal Department.
„ the Public Department.
„ the Public Works Department.
„ the Agricultural Adviser to the Government of India.
„ the Minister of Agriculture, Argentine Republic.
„ the Entomologist to the Government of India.
„ the Mycologist „ „
Copy to the Government of India, Revenue and Agricultural Department (with C.L.
Editors' Table.

REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE,

MADRAS PRESIDENCY

FOR THE OFFICIAL YEAR

1912-1913.

MADRAS:
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

1913.

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REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE

FOR

1912-1913.

I.—ADMINISTRATION.

(*a*) Staff.

Mr. G. A. D. Stuart, I.C.S., was in charge of the office of the Director of Agriculture until July 11th when he was relieved by Mr. Sampson who continued until October 18th when I took charge. Mr. Stuart was on tour for 54 days, Mr. Sampson and I for 69 days each—total 192. Coimbatore was visited on the whole nine times and every farm inspected and all except Taliparamba twice or more. Mr. Sampson toured through the villages affected by palm disease in the Gōdāvari and Kistna districts and I in the villages in which cotton work is in progress in Tinneveily. Mr. Stuart attended the cattle shows at Madura and Tiruppur and I the annual meeting at Tiruvallūr in the Chingleput district.

2. Mr. Wood, Mr. McRae and Mr. Hilson remained at Coimbatore and in the Northern Division respectively, otherwise the year has been one of change. Mr. Southern was transferred to the Punjab under the orders of the Government of India. Mr. Sampson was on special duty on the cattle survey till June 19th, so until October when I relieved Mr. Sampson at Madras, M.R.Ry. K. Ramasastrulu Nayudu Garu was in charge of the south without an assistant to help him. Mr. Harrison was on leave till October 15th. M.R.Ry. Ramasawmi Sivan Avargal acted for him.

Proposals were under consideration during the year to depute Dr. Barber on special work in connection with sugarcane. He assumed these duties on October 27th. Rai Bahadur M.R.Ry. K. Rangachariar Avargal acted as Government Botanist for the rest of the year. Dr. Barber had previously been relieved of all work connected with entomology by the arrival of Mr. T. Bainbrigge Fletcher on April 24, 1912. On Mr. Lefroy's departure from India, Mr. Fletcher was nominated Imperial Entomologist at Pusa but fortunately for Madras has been permitted to remain here till his successor arrives. He has not as yet come. The Botanical section was thus somewhat disorganized during the year and the opportunity was taken to obtain the sanction of the Secretary of State to provide separate officers for (1) economic work on crops and for (2) teaching at the college and for charge of the herbarium. (G.O. No. 2083, dated 12th July 1912). The Secretary of State also sanctioned the appointment of an Agriculturist to assist the Principal and take charge of the West Coast districts but had not appointed any one to that post before the end of the year. Assistant Director M.R.Ry. D. Ananda Rao Garu was on six months' leave from May 1913, M.R.Ry. K. Ramasastrulu Nayudu Garu was confirmed as Assistant Director with effect from 6th July 1912 on his passing his vernacular test. The

various branches on the scientific side are thus in charge of separate full-time officers, but the district staff requires strengthening as the demands upon it are steadily increasing and the areas the Deputy Directors have to control are excessive.

3. At the end of last year there were three vacancies in the assistant farm manager's grade. Seven more posts of second-grade managers on Rs. 50—5—100 were created by G.O. No. 2182, Revenue, dated 20th July 1912, and two temporary posts for five years (one manager and one assistant) were sanctioned in G.O. No. 3140, Revenue, dated 16th October 1912, for the sugarcane station. Thus there were twelve vacancies to be filled during the year, *i.e.*, 12 out of a total strength of 45. To these posts were appointed one who returned from Court of Wards' service, one old Saidapet student who, after a few months on a farm resigned, and five Coimbatore students, of whom one was soon seconded as Agricultural Instructor at Newington. The year thus closed with the district staff seven under strength. Appointments were offered to most of the diplomates of Coimbatore, but many declined stating that they preferred to manage their own or their relatives' land. Some of these vacancies will be filled from those who have recently finished their course, but this lack of staff retards district work which is of fundamental importance if the knowledge of improved practices is to be spread.

(*b*) Buildings and laying out of Farms.

4. More rapid progress was made with the buildings at Coimbatore than in previous years, but even so the construction of some appears to drag inexplicably. Especially is this the case with the water-supply scheme and the installation of vacuum and pressure pumps and light sanctioned in G.O. No. 786 W., dated 28th June 1911. The former has not as yet been handed over as complete whilst radical defects were discovered in the arrangements for the latter. Additional quarters for the staff to cost Rs. 24,100 were sanctioned in G.O. No. 706 W., dated 17th May 1912, but have not as yet been finished. These were designed to meet the needs of the colony as it stood in November 1910, and even when they are finished accommodation will be insufficient for present requirements. The Entomologist's bungalow sanctioned in February 1912, an Insectory to cost Rs. 4,100 sanctioned in November 1912 and pits for storing rain water—the water in most of the wells is brackish and hampers chemical and experimental work—to cost Rs. 5,600 sanctioned in January 1913, were all incomplete but in progress at the end of the year. The Mycologist's bungalow, the veterinary hospital and the herbarium cases were finished in the year, besides minor improvements to the farm, *e.g.*, cow-sheds, seed-store, etc. Fittings, etc., for the Entomological section to cost Rs. 7,000 were sanctioned in G.O. No. 1783 W., dated 28th November 1912, but work thereon had not been started by the end of the year. The extra land 10·02 acres mentioned in last year's report was handed over by the Revenue Department.

5. The building of a bungalow for the Deputy Director of Agriculture at Trichinopoly has been deferred under the orders of Government. Two power gins to enable the cotton from the seedfarms to be ginned rapidly were installed at Koilpatti and Nandyal respectively. The water-supply in the well at Koilpatti which has always been insufficient was considerably improved by boring. At Manganallur where a farm was newly opened at the end of last year, all the necessary buildings, viz., cattle sheds, office and store room, inspection bungalow, farm manager's quarters, were completed at a total cost of only Rs. 5,675.

6. The publication of the notification of acquisition of the new farm at Anakapalle was delayed owing to some difficulty in ascertaining to what extent water could legally be taken. It has since been acquired and taken possession of. The extension of 42 acres of Nandyal farm sanctioned in G.O. Mis. No. 2830, Revenue, dated 18th September 1911, was also acquired. In G.O. No. 889, Revenue, dated 25th March 1912, the Government of India allotted funds to Madras to open and work a sugarcane breeding station. Final sanction for the scheme was only obtained in October 1912, but the land, viz., 45·88 acres, about 2 miles from the college at Coimbatore, was acquired and paid for before the end of the year. Very commendable progress was also made in laying out the land in the construction of a road to it, of quarters for the assistant managers, etc., although Dr. Barber was necessarily much away on tour. The Bellary farm was closed on June 30, 1912.

II.—AGRICULTURAL EDUCATION.

7. The year opened with 46 students and closed with 41. Finally fourteen appeared for their diploma examinations and twelve passed. The two who failed were very weak in all subjects. They failed completely in one subject and also failed to obtain the qualifying aggregate of marks. In the second year, at which stage the examination in the allied sciences takes place, eight out of the nine who appeared passed, but all have been permitted to continue for the third year. We were fortunate this year in securing outside examiners in every subject and their constant testimony that the answers they received were not discursive but direct and to the point, and that the practical work was well done, reflects credit on the whole of the tutorial staff.

8. In a three years' course resignations from private reasons must occur, but it is disappointing to find in March only 41 on the rolls out of a possible 60. This is not due to a lack of applications. The numbers who have applied for admission in the years 1909—1913 inclusive are 423 although neither scholarships are given nor appointments guaranteed. As Mr. Stuart explained last year, some find difficulty in coping with the science which they meet in their first year and so fall out, others whose qualifications may appear to be good from their certificates find practical work uncongenial. It is difficult to select boys for practical agricultural education solely from their school-leaving certificates, so in the current year 35 out of 80 applicants were directed to appear for a preliminary examination from whom 20 were to be selected. They came to compete from Tinnevelly and Ganjām, from South Canara and Tanjore. This and the way in which the number of applicants keeps up further the belief that a real want would be met by dividing the course into a two years' one devoted mainly to agriculture and within the powers of most of the applicants of which some 40 could be admitted each year and into a later and more scientific one to which only the most promising of those in the earlier course would proceed. The Government before finally passing orders on this proposal have directed that the opinion of the Agricultural Board be obtained thereon next December.

9. The joint hostel mess continues to be a success and has been efficiently managed by M.R.Ry. R. V. Subramania Aiyar Avargal. The Students' Club is improving its position whilst the Agricultural Students' Union keeps together the old boys of both Coimbatore and Saidapet. Several of the latter are amongst its strongest supporters and their willing assistance is most cordially appreciated. The quarterly journal has been carefully edited and has made a most successful start. The third year students were taken by the Principal on two tours—one through the Cauvery valley and one to Madura, Tinnevelly and Palur. Their interest was noticeably stimulated when they came into contact with the ryots of the cotton villages who had tried improvements and who readily told the boys of their experiences. More lectures were given on plant diseases and insects than formerly, but in all these subjects the lack of good illustrations was felt. During the latter part of the year the boys were given a course of dairying. There is, however, no real milk breed in Madras and much work remains to be done to collect sound knowledge of dairying in this country.

10. *Non-official visitors.*—Six non-official visitors visited the college in all ten times. Their remarks were forwarded to the Board. Some of the defects to which they alluded will be remedied when the Forest College is in working order, *e.g.*, a dispensary and an Indian rest-house.

III.—RESEARCH AND EXPERIMENT.

(*a*) Agriculture.

11. Only a brief summary is attempted here as details are given in the reports on the several stations and in the appendices to this report. As usual in the case of crops harvested after the close of the official year, the results now discussed refer to the crops of 1911–12 harvested in April or May of 1912.

12. *Sugarcane—Varieties.*—At Samalkota, Coimbatore, Palur and Taliparamba, different varieties of sugarcane—both exotic and indigenous—were grown against each other. At Samalkota nine varieties were tested, at Coimbatore 17, at Palur ten and at

Taliparamba nine. The experience at Coimbatore confirmed that of other years, viz., that the wet land belonging to the farm is not really cane land and is entirely unsuited for experimenting with sugarcane. At Samalkota owing to lack of space the varieties could only be grown in small patches and the results when worked out to yields per acre are probably better than would be the case if they were grown on larger areas. Thus Java 247 gave jaggery at the rate of 9·8 tons per acre. B. 147 at the rate of 7·5 tons. Red Mauritius at 6 and B. 208 a little under 5 tons per acre. Crop-cutting experiments on ryots' land which for the first time were entrusted to this department showed that the ryots got five tons per acre from their Red Mauritius. It is very doubtful, however, if Java 247 or B 147 would show a similiar superiority in the district over Red Mauritius as they have done this year on the farm. They are being compared this year on somewhat larger areas, so results should be more reliable. Again both require somewhat more attention and care than do Red Mauritius canes. And there are two great reasons in the delta which militate against this bestowal of care by the ryots—

(*a*) Frequently the natural drainage of their land is bad or indifferent and to get good crops from high class canes drainage is essential.

(*b*) The holdings of the ryots are frequently so scattered that the canes are neglected whilst transplantation of paddy is in progress; the fields are half a mile or more apart and the ryot cannot control work in both places at once. The loss and labour wasted through the uneconomic distribution of holdings in this country must be immense.

The great asset of the Red Mauritius cane is that it can stand unfavourable conditions. The same report comes from the West Coast. At Taliparamba, " B. 208 in favourable conditions is a better cane, but it cannot stand water logging. Red Mauritius is a very hardy and adaptable variety which adjusts itself to varying conditions of soil, rainfall and drainage". At Palur there was difficulty in obtaining water from the channel and the sugarcane crop was mismanaged in the earlier stages and consequently no comparative results of any value were obtained.

13. *Manurial Experiments.*—As the experiments in previous years at Samalkota had shown that the addition of chemical manures to castor cake did not increase the yield of the crop the use of such manures was discontinued; and a start was made with a series of experiments to compare the value of the different cakes, viz., safflower, gingelly, pungam, ground-nut, castor and castor with cattle manure. So far castor cake is leading.

14. *Paddy—Varieties.*—The testing of different varieties of paddy at Samalkota, Palur and Coimbatore was continued. All the paddy that was sold from Samalkota was from selected strains. There are so many kinds of paddy in existence that at one time it was thought that each was on the whole pure. This is by no means the case and as was noted last year it is necessary to select single plants true to type and raise seed from those, rejecting strictly all which in subsequent generations do not maintain the superiority at first shown. At Samalkota seven single plant selections have been made and sown; at Palur where the work has been in progress longer a single plant selection from Garudan Samba has now been grown on field scale and has yielded both a much heavier and a superior crop than the usual Garudan Samba. If it maintains these qualities efforts will be made to spread it under a special name.

15. *Seed-rate.*—Experiments were continued to determine the best seed-rate for seed beds and the best distance apart to transplant. Really this ought to be worked out by each man for his own land. But generally if the land be treated fairly singles about 9" apart are as a rule most profitable. The fact remains, however, that except in the few cases in which doubles or trebles are planted for definite experimental reasons every paddy crop which is transplanted on our farms is transplanted singly. The average yield of main crop paddy over the whole wet area at Samalkota this year was 3,586 lbs. of grain, whilst the maximum yield found in any of the crop-cutting experiments on the ryots' land in the Gōdāvari was 2,900 lbs. of grain per acre or 1,302 M.Ms. as compared to 1,009 M.Ms. At Palur the average yield of paddy per acre in the main season over the whole farm was 2,119 lbs. or 963 M.Ms. as compared with 1,872 lbs. or 851 M.Ms., the maximum found in the local crop cutting experiments. These results are, of course, also in part attributable to better manuring—especially green manuring.

16. *Manurial*—(*a*) *Concentrated Manures.*—Experiments at Samalkota confirmed those of previous years, viz., that a dressing of superphosphate after green manuring improved the yield and was profitable whilst other chemical manures had no effect or produced such slight changes as to be unprofitable. The land at Coimbatore responds to a complete manure (*i.e.*, nitrogen *plus* phosphate *plus* potash) with better results when the phosphate is in excess. At Palur where these have been tried for the first time this year the addition of chemical manures to a green manure crop appeared to be unnecessary.

(*b*) *Green manuring.*—It is round the action of green manure crops that most interest at present centres. In individual cases large increases in yield have resulted from growing and ploughing in green manure crops and there is no doubt that this practice has improved very considerably the fertility of the land at Palur and Samalkota. Also it has proved very profitable in the Periyar tract. Yet very little is known about the method in which the ploughing in of such crops reacts upon the soil of paddy land. For the last few years Mr. Harrison has been engaged on a series of carefully designed experiments to determine the processes of fermentation which take place in a paddy field and to find some clue to the factors controlling the growth of the crop. His researches were leading him to the conclusion " that drainage or at least some movement of the soil-water is essential for paddy cultivation and especially so when bulky organic manures are applied ". Among his undrained plots paddy fared much worse in those that had received green manure than in those in which the soil was left unmanured. In the course of the year a farm was opened at Manganallur in the midst of very fine heavy soil of Tanjore delta. Sunnhemp was grown for green manure and treated in the method found to succeed at Palur and in Madura and the paddy was transplanted. It failed hopelessly. In the course of the green manuring the land had been flooded and dried, which it was found in this fine soil was sufficient to stop drainage. This result corroborates the results of Mr. Harrison's experiments that if there is no drainage a green manure crop unless very carefully managed is likely to have a deleterious instead of a beneficial effect. On the other hand there is little doubt but that the addition of bulky organic manures will in time improve the drainage of such land and incidentally the fertility. Experiments are being designed at Manganallur to discover how best to effect this. I look upon this failure at Manganallur and Mr. Harrison's work as two of the most important and instructive local agricultural events of the year.

17. *Cotton—Selection.*—Attention is still being paid to the improvement of cotton by selection. The objects kept in view are—

(1) improved quality of lint,
(2) increased percentage of lint to kappas,
(3) greater yield,

and in addition at Koilpatti to find plants of Karunganni which by ripening more rapidly will be suitable for cultivation in North Tinnevelly where the season is not usually favourable for Karunganni. Mr. Sampson in his report on Koilpatti explains how this is being done—both by general seed selection and by working from single plants. Selected seed and seed taken generally from a crop which had been grown from selected seed were sown on two similar adjoining fields at Koilpatti each measuring 5·90 acres. The result gave an increased return of Rs. 5–4–0 per acre in favour of the selected seed. The difference in favour of even general selection is marked. But it is from the single plant selections that the most permanent and best results are likely to accrue. These require much more attention and take longer to show results. Some are however beginning to appear at Koilpatti. In fact 20 acres in a neighbouring village has this year been sown with seed strictly descended from a single plant selected a few years ago. When last year grown on a field scale on the farm it gave $28\frac{1}{4}$ per cent. lint as compared with the general average of 25 per cent. for Karunganni and Mr. Steel of Messrs. Harvey & Co., valued the lint at half anna a lb. above the ruling market price on account of its superior quality. It is now in one of the villages. All the seed will be reserved for distribution in different villages and if it maintains its quality a distinctly improved strain will have been started worth in an ordinarily good year some Rs. 15—Rs. 20 an acre extra to the ryot—but as noted by Mr. Stuart last year it is much more difficult to prevent cotton cross fertilizing than was once expected. Other single plant strains also promise well but are

not so far advanced as this. Similar work is in progress at Hagari and Nandyal where strains have been obtained of a somewhat better colour and of higher lint percentage than the usual local varieties. The season, however, was generally unfavourable to cotton in the Ceded Districts.

18. A series of experiments are also in progress at Hagari to endeavour to find some more profitable rotation than that usually followed in Bellary district and to discover the effect of different manures on cotton. These will take some years before deductions can be safely drawn.

19. *Cambodia cotton.*—Selection work has not been done to any extent on Cambodia owing to lack of staff. It is hoped that, as a full time Economic Botanist has been appointed, something will be done in this direction.

20. *Ground-nut—Varieties* —Most of the work on groundnut is done at Palur and it is much to be regretted that the dry and garden lands at that station had a most unfortunate year. Early in the season one of the wells on which some of the irrigated ground-nut depended fell in and consequently has spoilt the results of the crops for purposes of comparison; on the dry lands also the rain was late and this was accentuated by the date of sowing being further delayed and consequently the proper growing season was missed. This was especially unfortunate as 'the trade' reports a decrease in the percentage of oil in groundnuts. The results on the farm so far go to show that, provided groundnut is alternated with a cereal no such deterioration occurs and the outturn is maintained. It would appear that the deterioration is due to indifferent cultivation and neglect of rotation—a natural result of the spread of this crop to new districts and the desire of the ryots to reap immediate profits regardless of the future.

21. *Other Crops—Sorghums.*—Selection work was continued at Hagari and Coimbatore. The work, however, was checked at Coimbatore owing to a poor crop through sowing the seed late. All seed at both stations is treated with copper sulphate before sowing as a precaution against 'Smut'. An attempt has been made to introduce Periya Manjal cholam into Tinnevelly as a fodder crop. It provides much better fodder than the local varieties but the heads are subject to Sugary Disease. Unless of course it gives seed freely it will be useless as a fodder crop for Tinnevelly. Selections have therefore been made from plants the natural formation of the flowers of which is not favourable to this disease and these selections are being tried.

Ragi.—The results of experiments over a series of years at Coimbatore indicate that, provided the seed-rate is maintained to something like 165,000 plants per acre, (*a*) a greater outturn is obtained by planting ragi on the ridge and furrow system instead of on small flat beds, and (*b*) a saving of water is gained thereby which would be sufficient for about another 20 cents of land per acre under ragi.

Cumbu.—The Transvaal cumbu which at first had done so well at Coimbatore had become very badly cross fertilized and fresh seed has been ordered from Messrs. Vilmorin & Co.

Pepper.—The need for good manuring has been further emphasized if profitable yields of pepper are to be obtained. The block which gets lime and leaf mould continues to improve. In 1907 it yielded $5\frac{3}{4}$ Madras measures of pepper which, in 1912, had risen to $113\frac{1}{2}$ Madras measures and, in last year, was 140 Madras measures. Fish manure also gave good result. "Pollu" disease was bad in one plot.

Other crops.—Work has been continued at the different stations with a variety of other crops, the pulses, wheat, ginger, castor, tobacco, maize, onions, etc. The most successful of these are the introduction of ginger into North Malabar and the introduction of raising onions from seed on ridges in Tinnevelly. Mr. Barry cultivated Sumatra tobacco successfully on the lankas but he is hampered in curing the leaf properly through lack of proper buildings wherein he can control both the temperature and humidity of the atmosphere. It is necessary to control both these if uniformly cured leaf is to be obtained.

22. *Special manurial experiments.*—Experiments have been in progress for some nine years at Koilpatti to determine the most profitable method of storing and using cattle manure. The manure prepared on the box system is undoubtedly richer in nitrogen, phosphorus and potash than that stored in the usual way in a pit or

heap; it is, however, as a rule, not so thoroughly decomposed and so, when applied to the soil does not possibly work in so thoroughly. The experiments clearly show that for the shallower rooted cereal crops, *e.g.*, cholam and cumbu, manure preserved in the box system gives better results than that preserved in heaps or pits, whilst with the deeper-rooted cotton it is more profitable to use "heap" manure. The results are clear and instructive. The experiment is being discontinued.

23. *Special cultivation experiments.*—Many experiments are in progress on seed rate, method of planting and sowing, cultivation of land, etc., on many crops from which deductions cannot as yet be drawn.

Stock.

24. *Live-stock.*—Mr. Hilson's selected flock has continued to improve and increase at Bellary. The wool obtained is of promising quality. The flock is however small at present but the work promises well. Prolonged efforts will be necessary before a really good dairy herd is formed at Coimbatore.

25. *Cattle survey.*—In G.O. No. 3072, dated 16th October 1911, Mr. H. C. Sampson was placed on special duty to prepare a report on the cattle of the Presidency with special reference to certain specific points mentioned by the Government. The report was prepared and submitted in July 1912 and orders thereon are awaited.

(*b*) CHEMISTRY.

26. The report of the Agricultural Chemist is printed as Appendix III. The memoir prepared by Mr. Harrison and his Chief Assistant M.R.Ry. M. R. Ramaswami Sivan Avargal on the black-cotton soils of Madras was published at Pusa during the year. His important memoir on the aeration of the roots of paddy and on the intimate connection between green manuring and drainage was completed and sent to Pusa shortly after the close of the year. Paddy is cultivated in such a different manner from the crops that have been investigated in the west that many of the results there obtained are inapplicable to paddy and little is understood about the conditions controlling its growth. On some of these problems Mr. Harrison's memoir throws some light. A rough soil survey of the Kistna district delta has been prepared which is of assistance in answering enquiries about fertilisers. The total number of analyses carried out has increased vastly and the number of analyses made at the request of private enquirers which numbered 59 in 1909 continues steadily to increase and last year totalled 118.

(*c*) BOTANY.

27. The report of the Acting Government Botanist is printed as Appendix IV. As already stated Dr. Barber was largely engaged in the earlier part of the year in preparing for his special work on sugarcane and the work that had been started in previous years in the Botanical section was necessarily interrupted. Rai Bahadur M.R.Ry. K. Rangachariar Avargal in addition to his regular work has begun an economic study of the weeds of South Indian arable land. Nothing so far has ever been done on this subject and although the work will take some years to complete it should prove useful. The herbarium received considerable attention in order to be as complete as possible when required by Mr. Gamble for preparing his work on the Madras flora.

(*d*) ENTOMOLOGY.

28. The report of the Government Entomologist is published as Appendix V. This was the first year this section was worked independently under an Entomological expert and consequently much initial work had to be done. Delay in completion of much of this has severely hampered progress but as the report shows the collection of insects was greatly increased and arranged and although publication has been hampered by a lack of artists much information on local pests has been prepared which it is hoped will be consolidated and issued in book form. Of economic pests the one possibly most in evidence in the year has been the Deccan grasshopper which did considerable damage in Bellary and Kurnool. Mr. Fletcher was in several of the affected villages in August with his assistants and showed the people how to use bags, some of which were left in the villages to be used by the ryots. In previous years late ploughings had not proved effective in destroying egg masses. This year a

badly infested area of 27 acres was thoroughly ploughed with an iron plough in December. The Entomological Assistant who examined the field thoroughly in February only found egg masses inside heavy clods which had remained unbroken. Leaflets were published in the vernaculars and distributed widely explaining how this pest can best be fought. The life history of the weevil attacking Cambodia cotton has not yet been worked out. The pest was not so serious in Coimbatore as it was last year. In conjunction with planters in the different districts a scheme of experiments was prepared to ascertain how far the fertilisation of coffee is due to bees. The conduct and results of these trials belong to the current year.

29. *Sericulture.*—Mr. Fletcher considers that the climate of Coimbatore is much too dry to enable broods of the Eri silkworm to be raised successfully. Work is, however, in progress to see what can be done for the mulberry silk industry in Kollegal and for this purpose a special fieldman was deputed at the end of the year for a month's training at Pusa and in Bengal (G.O. No. 396, Revenue, dated 7th February 1913).

(*e*) Mycology.

30. The report of the Government Mycologist is printed in Appendix VI. As in former years the most obvious disease with which he is confronted is the bud rot in palmyras in Kistna and Gōdāvari. The area in the Kistna in which the special staff was at work was reduced as the severity of the disease has undoubtedly abated in that delta. Reliance is now placed on the district staff to deal promptly with and report if any recrudescence appears in the taluks not now patrolled. More dead trees were cut in the Gōdāvari than in former years owing to an increased staff but it cannot there be said that the virulence of the disease has very appreciably abated. Two facts have come out during the year—one distinctly disconcerting and the other encouraging. The disease has been discovered at two isolated centres one in each district some 10 miles further inland on the edge of the dense growth of the upland taluks. Mr. McRae considers that it must have been in one of these villages for the last five years unknown to and certainly unreported by the villagers. The neighbouring villages are now carefully patrolled and a new and well-illustrated leaflet has been prepared and distributed in large numbers. Diseased trees may live for a long time before death and throughout that time are a source of infection. It is clear that the scheme of operations ought not to exclude these trees and it is encouraging to find that such trees upon which Mr. McRae operated drastically recovered and put forth a healthy growth apparently free from all disease. Opposition to operating on an infected tree is obviously greater than that which—and that too has often been considerable—is experienced when dead trees are cut. But some progress has been made with it especially in the Kistna district. The brunt of all this work falls upon the district authorities. If any illustration were needed of the practical utility of a Mycologist in this country it could be shewn by Mr. McRae's work on the Koleroga or Mahali disease which had appeared on areca palms in South Malabar adjoining Cochin. It is similar to the disease in Mysore and was attacked in the way adopted there by Dr. Coleman. In all 2,100 trees were sprayed and the ryots were so satisfied that all except one whose reverence for an aged father's prejudices outweighed his business instincts, asked that it might be repeated this year. Accounts were kept in three of the gardens involving 500 sprayed trees and 500 unsprayed ones. The cost of the operations excluding cost of the machines was Rs. 2–12–6 per 100 trees. The sprayed trees gave an increased yield over the unsprayed ones worth Rs. 23-10-0 per 100 trees. Operations have been extended this year to a portion of South Canara adjoining Mysore. A disease of cocoanut trees near Tamarasseri in Malabar was reported during the year. Its cause has not yet been determined. Twenty-five bundles of diseased plants were received from the public for advice, and two hundred and forty specimens of fungi were collected during the year.

(*f*) The Sugarcane Breeding Station.

31. As the steady increase in the yearly imports of foreign white sugar into India accompanied with its low price was combined with a steady decrease in the area under cane and a decrease in the number of sugar mills and refineries in the more important sugar tracts of India the Government of India in 1911 instituted enquiries as to what steps could be taken to arrest this decline. The problem was then serious

in Northern India and especially in the United Provinces. There were really two questions to be studied (*a*) an engineering one (*b*) and agricultural and botanical one. It is with the latter that Madras is now concerned. In all ordinary cultivation in India sugarcane is always reproduced vegetatively and thus whilst the maintenance of a type is comparatively easy the number of variations and opportunities to improve the type are small. One great reason is that usually in India canes fail to set fertile pollen. This is not, however, the case in the neighbourhood of Coimbatore. After considering the recommendation of the Board of Agriculture the Government of India decided to make a grant to the Madras Government to open and manage for five years a sugarcane breeding station at Coimbatore under the charge of Dr. C. A. Barber, Sc.D., in order to see whether by collecting and studying canes of many varieties and raising seedlings from them whether by cross or self-pollination some new and superior varieties could not be evolved suitable especially for Northern India. Dr. Barber joined his appointment as sugarcane expert towards the end of October 1912. His report is printed as Appendix VII. Much work of a preliminary character had naturally to be done in the ensuing five months in laying out the land, preparing estimates, etc., and I must say that Dr. Barber and his staff have made exceptionally good progress in opening the sugarcane breeding station and preparing it for future work. This is especially the case as they have also brought through 2,000 seedlings when at one time there was imminent danger of most of the work of the season being lost. From the conception of the scheme it is essential to keep in close touch with Northern India. For this purpose Dr. Barber made two extended tours from Bihar to the Punjab.

(*g*) Pisciculture.

32. Sir Frederick Nicholson, K.C.I.E., contributes the following summary of the work of the Fisheries Department. His fuller report is printed as Appendix VIII.

Fresh water.—Mr. H. C. Wilson, Piscicultural Expert, was in charge of this branch as in previous years. The Sunkesula fish farm, near Kurnool, advanced a stage in that 41 miles of the canal were stocked resulting in an increase of nearly 100 per cent. in fishery rentals. The murral portion of the farm was also developed so that fish became available for sale, and a special market stall at Kurnool for the sale of fish from live tanks, was sanctioned. Special appliances were devised for the breeding and transport of fish.

The head of trout in the rivers near Ootacamund greatly increased, and Rs 1,495 were received for fishing licenses; some of the fish taken weighed up to 6 lbs. each. The Avalanche hatchery was maintained and the automatic American spawning race did good work. The protective measures in the upper waters of the Moyar and Bhavani have led to a large increase in all classes of fish, and it is now proposed to issue licenses for mahseer fishing in these rivers.

The hilsa breeding operations at the Lower Anicut were not successful owing to the great paucity of spawners whenever the Piscicultural Expert was able to visit the locality, this is found to be the case with shad in America. The failure this year points to the need for permanent arrangements at some convenient centre.

Tank stocking was almost at a stand still owing chiefly to want of water in the tanks selected; others have been substituted. The Barur tank recently stocked had a good head of fish.

Important experiments in growing fish destructive of mosquito larvæ were conducted on a considerable scale at Sunkesula and have led to practical and successful work by various municipalities and other public bodies.

Three large projects were under investigation, viz., Allur in Nellore for stocking the great tanks under the Sangam Works, the Colair lake floating hatchery for hilsa with a connected farm for murral, and a scheme for acclimatizing on the plains tench brought from the Nilgiris.

Marine.—Mr. James Hornell, F.L.S., was in charge *inter alia* of these operations. The oyster farm at Pulicat came into bearing during the year and produced excellent oysters in large numbers, mature and in full condition at 20 months from

spatfall; later in the year it was troubled by drought causing insufficiency and undue salinity of the water and later still by unusual floods of fresh water, so that the oysters temporarily suffered in number and quality.

The construction of the large 160 acres fish farm at Tuticorin for the cultivation of fish, pearl oysters, etc., was delayed by want of the detailed estimates and working plans which are now before Government.

IV.—DEMONSTRATION, AID TO THE PUBLIC SHOWS, AGRICULTURAL ASSOCIATIONS AND GENERAL PROGRESS.

33. *Sugarcane introduction.*—The demand from Samalkota was very small as disease was not bad in the delta this year and as a decrease in the area under cane is threatened owing to the fall in the price of jaggery. Moreover, Red Mauritius stands the unfavourable treatment it so often receives in the delta-insufficient drainage—as well as or better than any other variety. Similarly on the West Coast where the cultivation of cane is a new thing and is spreading, Mr. Couchman, who, since his return from leave, has inspected very many of the plots of new cane in his district, informs me that, in South Canara, the hardy Red Mauritius is there growing in favour at the expense of B. 208—itself a very good cane. It is reported that the canes which were introduced into South Canara from Taliparamba farm are now being passed along into North Canara in the Bombay Presidency. The use of iron mills, improved furnaces and boiling pans is also spreading and much of the time of one of the assistants at Taliparamba is spent in showing ryots how to use these.

34. *Cotton—Improvement of seed and seed distribution.*—In Tinnevelly in 1911–12 the general crop yield and ginning percentage were low on account of late and short sowing rains. As mentioned in last year's report, it is customary to open seed depots in different parts of the cotton tract and change their locality from year to year. But there was such a run on the seed this year that the stock at Koilpatti was sold out before it could be distributed in the villages of the circle. The 18 village depots in the south were also quickly sold out. In all 58,255 lbs. of cleaned selected Karunganni seed obtained from 397 acres of seed farm were sold at a price well above that in the local market. A difficulty which may become acute in this work of improving the strain of cotton in Tinnevelly is alluded to in Mr. Sampson's report. A marked feature recently in the development of the cotton trade in the south is the increase in the number of ginning factories. The tendency in many villages now is for the ryot to give over all his crop to the trader who takes it and that of other ryots to the ginnery. Seed is returned but without great care it is almost impossible for the ryot to be certain that he gets back pure undamaged seed. In the old days when much of the cotton was ginned in the villages the ryot was fairly safe to get back seed from the crop he grew and it was sufficient for the Agricultural Department to sell good strains in different villages to ensure a continuance of the same for at least a few years. And there is no doubt about the great improvement which has been thus effected. The crops which are to be seen in the fields are much purer than those to be seen eight years ago. In those conditions Mr. Stuart's summary of the work in last year's report was justified. But in the changing circumstances now becoming apparent two courses appear open to the department. The first and in many ways the easiest is to attempt to control the seed market by starting seed farms on a much larger scale than has ever hitherto been contemplated. This is open to serious objections, (*a*) it would absorb the energies of a very large staff, (*b*) it would tend to divert attention from the constant work of single plant selections which is now promising well at Koilpatti farm (*vide* paragraph 17 *supra*) to the more immediate needs of keeping the quality moderately high and so would tend ultimately to check improvement and (*c*) it seems undesirable to lead the people to be dependent on Government seed farms for their seed. The other course which will certainly be more difficult at first than merely extending the area of our seed farms as far as our staff will permit, is to try and get the villagers to adapt themselves to these changing conditions. All the leading cotton firms in Tinnevelly have been addressed and in response have very readily undertaken to clean out a gin thoroughly, gin immediately and return the seed at once to any group of villagers from a village who have raised cotton from seed supplied from our seed farms and who will combine and bring in the kappas direct to the gin. Most of the firms are

anxious for pure Karunganni cotton of good quality especially those who are not only exporters but also spinners. The mixing which causes the spinners so much trouble and helps to depress the price of Indian cotton is in Tinnevelly the work of the trader who collects the produce of different ryots who have really grown different grades of cotton. He mixes the lot. Here is then a chance for village co-operation. If a village which has grown cotton from our seed farm seed would combine to take the whole produce direct to the gin they stand to gain in the following ways:—

(1) Payment is made on the quantity of lint after ginning. Practically all our seed gives a higher ginning percentage than the district average (*vide* paragraph 17 *supra*) and hence there is more lint.

(2) They by the firms' present arrangement get back pure undamaged seed for next year's sowing.

(3) This seed should be approximately as good as that of the seed farms and if this became known they ought to be able to dispose of their surplus at profitable rates.

(4) If the lint was of markedly superior quality they might get somewhat over the market prices. Some of the villagers in three or four villages have under persuasion tried this plan this year. The failure or success which has attended the effort is for next year's report. But the work is not as simple as it may read. For instance one village complained that they were paid at the factory at the same rate per pothie as they would have been paid in the village by the trader. This was true, but they had been paid on true weights instead of on weights which were false against them to an unknown degree. It may prove impossible to get such associations to work—progress would certainly be slow—but if they could be formed the improvement of the seed supply in Tinnevelly would be on a firm basis and they would prove most useful agencies to whom the better types, which will be evolved at Koilpatti from time to time could be first distributed.

In Kurnool and Bellary the same system of working through seed farms is adopted and during last year the work was on a larger scale than hithertofore. From the cultivation of 1908 about 3,000 lbs. of improved seed were sold to ryots in Kurnool; from the crop sown in 1909, 18,700 lbs.; from that sown in 1910, 44,115 lbs. were sold in Bellary and Kurnool whilst last year 84,132 lbs. were sold sufficient seed for over 6,000 acres. And in the year 1,000 acres of seed farms were opened in Kurnool, Bellary and in the Gooty taluk of Anantapur. The seed from these farms will of course be used this year. It is expected to have another 1,200 acres this year. The total net cost to Government for the working in these three districts during the working season, *i.e.*, the calendar year of 1912 was only Rs. 4,225, the total cost being Rs. 30,149 and receipts from sales, etc., Rs. 25,932.

Cultivation.—Concurrently with the introduction of the better cotton-seed into Tinnevelly efforts have been made to introduce the use of seed drill and bullock hoe. The area over which these implements are being used is steadily increasing and was last year 3,773 acres as compared with 1,619 acres two years previously. The increase last year was entirely due to a wider use for cumbu and I saw some excellent crops of cumbu raised by the ryots on this method. They would most probably have been used a larger extent on cotton but the sowing rains were first late and then very general so that the sowing season was short and there were not sufficient coolies trained in the use of these implements at hand. In a few villages the local artisans are beginning to make them. From Koilpatti 14 sets were sold. Periodical deep ploughing has been shown to have a beneficial effect on black cotton soils though a thoroughly satisfactory plough has not yet been found. A rotating disc plough which ploughs two furrows at once and which has been sent to Coimbatore by Messrs. Ransomes Sims and Jefferies promises well.

35. *Cambodia cotton.*—This continues to spread though I understand that the area under it in Tinnevelly was less than in the previous years owing to the fall of price. It is a matter to a considerable extent in the ryots' own hands. It is difficult to persuade him to keep his cotton pure and not mix it either himself or sell it to a trader who mixes it. An illustration of this occurred at Coimbatore where Messrs. Stanes & Co., commented on the superiority of the Cambodia lint sold to them from the

farm. It had only been carefully cultivated and when picked was picked over carefully to remove all stained or discoloured lint. There was no difference between the seed that was used and the seed sold to the ryots. But at the price at which the lint was sold it gave a return of Rs. 163 an acre against total cultivation expenses of Rs. 45 an acre. Complaints have been received from some of the firms alleging deterioration of the staple. Work is needed on this crop but for lack of staff it has not been possible to do much serious work thereon as yet. However where it is carefully cultivated the quality is maintained. Cambodia seed is now freely obtainable but yet 34,277 lbs. of it were sold from the farms in 1912 yielding a profit of Rs. 118 on transactions totalling Rs. 2,480.

36. *Paddy seed.*—Although, as explained in paragraph 14, none of the seed raised from single plants has as yet been raised in sufficient quantity to justify special sale yet all the seed sold from the farms is raised from seed selected generally and is purer and truer to type than the ordinary seed procurable. It all finds a ready sale. This is notably the case with Konamani at Samalkota and the paddy grown at Taliparamba. Some of the new varieties are advancing in local favour as for instance Rascadam with the Muhammadans round Palur. But work on paddy has been mostly confined to the reduction of the seed rate (*i.e.*, single seedling planting) and the introduction of green manure.

37. *Seed rate.*—It may be thought sometimes that the cry of single seedling is being overdone. But Mr. Stuart's estimate that the adoption of an economic seed rate would be worth 100 lakhs of rupees a year to the Presidency was a conservative estimate. The system has gained greatest favour in the South and several of those who have tried it were asked to state their opinion. I am indebted to those gentlemen who have allowed their letters to be collected and published in leaflet form (No. I of 1913). They come from different districts and have sent their replies to different offices. They all agree that the system results in (*a*) saving in seed, (*b*) saving in labour (*c*) increased yield. If some of the letters—by no means the most favourable—be taken it will be seen that excluding all saving on labour a correspondent from South Arcot states that the increase which he obtained by adopting this method is 175 Madras measures an acre, one from Tanjore reckoned 99 Madras measures, one from Tinnevelly, 78½ Madras measures and one from Malabar between 75–80 Madras measures. These figures are from widely different places, and it would be *moderate* to place the profit at 77 Madras measures per acre exclusive of saving on labour which is about another two rupees. This year in South Arcot paddy was sold on the threshing floor at 11 Madras measures for the rupee, in Gōdāvari at Rs. 5 per 160 lbs. which is practically the same. At this rate the profit exclusive of savings on labour is Rs. 7 an acre. There are about 5 million acres of paddy transplanted every year, so the universal adoption of this system alone would mean 35 million rupees exclusive of at least another 5 millions saved in wages. Even if "to allow for errors" this estimate be halved there still remains sufficient justification for repeatedly urging people to try it. The practice continues to spread and will do so and the vernacular agricultural papers have assisted largely in disseminating knowledge about it, but the custom is as yet by no means universal. For instance economic seed rate has been the custom for 11 years in the Kistna delta, but it has never spread into the Gōdāvari although those there who have now recently tried it are certain of its merits. In accordance with the Board's orders on last year's *report* Tahsildars furnished me with figures purporting to show the area transplanted from single seedling in their taluks. I have not used the figures because they were obviously incorrect. I thus do not attempt to frame any estimate of the progress of this system. Instances of its adoption are found frequently when not suspected and fields which one might have expected to be thinly planted *are* not. For instance none of the fields actually adjoining Samalkota farm are planted thinly though some within half a mile away are. What is needed is more men in the districts to show, to advise and persuade.

38. *Green manuring.*—The experience of the year can be briefly summed up as increased demand, contraction of the sources of supply and difficulties on account of short staff. Except in South Arcot sunnhemp has decreased in favour, kulinji and Bengal daincha being preferred. The supplies of Bengal daincha sent to us from Calcutta were not very satisfactory and this year arrangements are being made with ryots to

grow daincha on contract for seed for the department. In the past most of the kulinji was obtained from the neighbourhood of Sivagiri where last year's supplies were short. Definite contracts have been made this year with ryots in other parts and it is thereby hoped to ensure a better supply. Yet in spite of this, over 18,700 Madras measures of green manuring seeds were sold as compared with 26,000 Madras measures last year. Yet the use of green manuring was much more extensively followed in Periyar area than in the previous year as private agencies are starting to work there. In addition to that, fresh ground was broken by the department notably in Sholavandan neighbourhood and in Chittoor district. At the time of writing this report there is a strip of land over two miles long and about five fields broad near Sholavandan uniformly covered with green manure crops. In Chittoor where the practice is entirely new, an Agricultural Inspector was at work and several of the ryots are trying the effect of this method. One ryot near Madura who tried it in 1912 on a compact block of 100 acres claims to have doubled his former profit at the ensuing harvest. Old students of the college are also following the practice in Malabar and it has been introduced from Taliparamba into South Canara. So that although the actual sales by the department were less than in the previous year, the system continued to spread in tracts where it had been introduced and was started in districts where it was unknown. Arrangements have also been made to ensure larger stocks for this year.

39. *Pattimannu work.*—The treatment recommended as an efficient substitute for Pattimannu in the Kistna delta is usually a green manure crop and then a dressing of superphosphate. In a small tract potash is also useful. As was stated in last year's report demonstration work was closed in Kistna. Messrs. Parry & Co. have very kindly sent to me figures showing that as a result of their agency work the ryots in the district are themselves trying the effects of superphosphate. Work has now been started in Guntūr district and plots selected and harvested.

40. *Other crops.*—Among minor crops which are growing in favour in certain districts are ginger in North Malabar from Taliparamba and whence last season 2,800 lbs. of ginger seed were sold locally and onions raised from seed and grown on ridges in Tinnevelly from Koilpatti where such was the demand for seed the ryots were offering Rs. 6 a Madras measure. Twelve acres of ragi were cultivated on the ridge system in the Tuticorin Circle. The demonstration work conducted by the Mycologist against Koleroga is described in paragraph 30 *supra*.

41. *Implements.*—The spread of the use of the drill, etc., has been alluded in a previous paragraph. Also in Tinnevelly 80 acres were ploughed deeply with the cotton soil plough as compared with 30 last year. The complaint that the cattle would lose condition if put to work on this plough was not so persistent this year. The sale of implements from Palur continues to extend chiefly 31 Scind ploughs, 24 harrows.

Cattle shows.

42. Ongole and Tiruppur were again the only cattle shows of merit. Agricultural lectures were given, demonstrations held and exhibits sent to Tiruppur, Madura and Pudukkōttai where an exhibition was held at Christmas. An exhibit was also sent to the Mysore Dassarah exhibition.

Agricultural associations.

43. The Kumbakōnam association has opened a co-operative branch to supply seeds, manures, etc., to its members. It was supplied with green manure seeds from the department at special cheap rates. The association stated that 20 cheap ploughs made by Messrs. Burn & Co. were sold during 1912. The Ganjām association stated that prizes were given for fields raised from single seedlings and that in 1912 there were 70 competitors as compared with four in the previous year. In Malabar an attempt has been made to get into closer touch with the villages by forming in a few different villages small associations of cultivators who are prepared to work. The idea is that their energies should not be dissipated over a variety of possible and impossible schemes but that one or two definite improvements should be attempted by the members in the village, *e.g.*, economic seed-rate. The officers of the Taliparamba

farm have visited all these so far formed and have drawn up and given careful and detailed instructions. They will tour whilst the crops are growing. Remembering past experience it would be rash to be sanguine, but if healthy village associations can be formed there is some chance of practical work resulting. The most successful Agricultural Co-operative Society is at Bāpatla which has had another successful year. Throughout the whole of the year the fate of the Central Agricultural Committee was in the balance. The Government decided in Revenue No. 360, dated 5th February 1913, to continue for another year the concessions the committee receive.

General progress.

44. The amount of correspondence between the department and literate ryots continues to grow steadily larger. And if a wide view is taken of what this promises and of what has been done and of the possibilities which work on the different farms discloses there are great possibilities of wide and general progress. But if attention be concentrated on the work of the year sure progress has been made, *e.g.*, to mention some usually forgotten the spread of the cotton work in Kurnool, green-manuring and single planting in Chittoor district, spraying areca-palms in South Malabar, but much more progress would have resulted had it been possible to have had more men in the districts. The district staff was shorthanded throughout the year, and work in South Arcot and Tanjore was grievously restricted in consequence. There are also still very many districts untouched. Two theories about the ryot are often advanced—not that either ever troubles him. This is perhaps fortunate because neither is true. One represents him as the intensely conservative custodian of centuries of agricultural tradition; the other replies that it is only necessary to show him that a process pays and he will adopt it. Some new crop which some may have cultivated successfully catches the imagination and spreads very rapidly, *e.g.*, ground-nut or Cambodia cotton. It is grown on all manner of unsuitable soils and is subjected to treatment which is not given to it where it is better understood. But it requires much closer work to persuade ryots to adopt a new process of dealing with a crop with which they are already accustomed. Yet it is by fostering habits of better practice that the most permanent improvement in the agriculture of the Presidency can be won—more care with the seed, purer crops, better tillage, better management of the land. Whether work be conducted through village associations or not this means more local work in the villages or in other words more qualified men in the districts.

V.—AGRICULTURAL ENGINEERING.

45. The increase in the cost of cattle and labour is breaking down the prejudices against the use of improved implements. Instances have been given in the report of the use of heavier ploughs and harrows. There is no doubt that the use of these will spread and elementary instruction in mechanical engineering is of more importance than lectures on the principles of Civil Engineering. This disc plough now on trial at Coimbatore promises to be very useful.

VI.—PUBLICATIONS AND SUPPLY OF INFORMATION.

46. The following bulletins and leaflets were published during the year:—

No.	1912.		
I.	The methods of reclaiming saline soils.	Mr. W. H. Harrison ..	English. Tamil. Telugu.
II.	Note on the Agricultural College, Coimbatore.	Mr. R. Cecil Wood ..	English.
III.	Deccan grasshopper pest	Mr. T. Bainbrigge Fletcher.	English. Telugu. Canarese.
IV.	Budrot of palmyras in Gōdāvari and Kistna districts.	Mr. W. McRae	English. Telugu.

No.	1913.	
I. What the ryot has to say about the single seedling of planting of paddy.	Mr. H. C. Sampson	English. Tamil. Telugu. Malayalam. Canarese.
II. Insect pests	Mr. T. Bainbrigge Fletcher.	English. Tamil. Telugu.
III. What the ryot has to say about the use of drill for sowing seed.	Mr. H. C. Sampson	English. Tamil.

Bulletin No. 65.—Note on the Indigenous manures of Southern India and their application by Mr. W. H. Harrison.

Bulletin No. 66.—Note on the Manuring of sugarcane at Samalkota Agricultural station, 1902-12, by Mr. G. R. Hilson.

47. Very large numbers of many of the leaflets were distributed through Collectors in the course of the year. Over 71,000 copies of the calendar which is published in six languages were distributed. Articles out of former issues of the calendar have been reprinted in the Agricultural Journals of other tropical countries.

VII.—STATISTICS.

48. *Crop forecasts and crop-cutting experiments.*—The work in connection with these was transferred to this department in G.O. No. 1912, dated 28th June 1912 and G.O. No. 2686, Revenue, dated 4th September 1911. Eighteen reports on forecasts of crops were issued during the year and 20 crop-cutting experiments were conducted by officers of the department.

VIII.—MISCELLANEOUS.

49. As the district staff was so shorthanded it is only fair to state that at Koilpatti and Taliparamba both the farm and district work were very good and the farm work at Samalkota.

MADRAS,
7th July 1913.

D. T. CHADWICK,
Director of Agriculture.

APPENDIX I.

THE ADMINISTRATION REPORT OF THE AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE AND THE CENTRAL FARM, COIMBATORE, FOR THE YEAR 1912-13.

College.—Again the annual report has to open with a note of complaint at the delay in the completion of parts of the college by the Public Works Department. In the last three years' reports, mention has been made of the water-supply to the college and estate, and it is a matter for regret that this is still incomplete. The actual supply is much better than before, but the installation is still unfinished and has not yet been handed over by the Public Works Department. The electric lighting and power scheme is in worse state: the countershaft and pulleys for driving the dynamo have been found faulty, and are being replaced, with the result that the college, after five years of useful work, is still without a means of illumination.

It is satisfactory to note that the lecture rooms and assistants' rooms have at length been completed, while the furnishing of the Library, which is now complete, commands admiration from the dignified design and the excellent execution of the book-cases. The museum is still incomplete, though the work still to be done should not take very much longer. The scheme for the collection of the rain from the extensive spread of the college roof is at last taking form: the plans and estimates for this work were first called for by the Superintending Engineer in an inspection note written in April 1910; the need for more quarters has been very keenly felt, and the completion of those now under construction will afford great relief. At the risk of seeming to be an inveterate grumbler, I would observe that the need for more quarters was first brought to the notice of the then Director in November 1910; detailed estimates of the actual number of quarters required were submitted in August 1911, and after approval by the Director, the Board of Revenue and the Public Works, were sanctioned by the Government in May 1912. Construction was only commenced towards the end of the year, and the quarters are at present, about a third completed. Meanwhile the demand for quarters has increased, and in October I submitted proposals for the construction of 1-A, 7-B, 18-C and 10-D type quarters for which, I regret to learn, there seems very little chance at present.

2. *Visitors.*—The college has again been honoured by a visit from the Governor, His Excellency the Lord Pentland, spending a few hours here on the 10th of April this year, when he was shown round the college building and a portion of the Farm. The Hon'ble Sir J. N. Atkinson, K.C.S.I., came down for College Day; the Hon'ble Sir Harold Stuart and the Hon'ble Mr Sivaswami Aiyar visited the College in July and September, respectively.

The Commissioner visited the college once in February; the Director of Agriculture five times and the Deputy Directors three times, each for the purpose of examining the students. Of the twenty-five honorary visitors, six visited the college during the year. M.R.Ry. C. Venkatachariar four times, M.R.Ry Vengail Kunhi Krishnan Nayanar twice, and M.R.Ry. Rao Bahadur Annaswami Tevar Avargal, M.R.Ry. P. Subbaraya Aiyar Avargal, M.R.Ry. Marella Gangarazu Pantulu Garu and M.R.Ry. Kannamlu Ramanunni Valia Nayar once each. Their remarks were duly forwarded. The minor Zamindars of the Court of Wards paid us their usual visit in July.

3. *Students.*—The number of students at the commencement of the session was forty-six: sixteen in the third year, ten in the second year and twenty in their first year. During the year, two students have resigned from class I and another student has failed to qualify. As he is not a candidate for employment under the Government, I have suggested to him that he take a special course, remaining one more year, and doing partly second and partly third year work. The second year class remained at nine throughout the year; all will proceed to their third year. Applications for the coming year have been received to the number of fifty-six: the forms were sent out rather late, and applications are still being received, but the numbers show a decline for which it is not easy to account.

One student from Hyderabad, who was in arrears with his tuition fees, was expelled for bringing notes into an examination, and as he subsequently refused to pay the sums still due, legal steps were taken against him, which have been successful: the case was given against him and his brother with costs in the Munsif's Court in March this year.

4. *Teaching.*—Since last report, the small lecture room has been fitted with benches, while a platform has been fixed in the large lecture room. An improvement was also effected in the physics laboratory by the fitting of a long wooden bench down one side: this was in accordance with the wishes of the second Assistant to the Government Agricultural Chemist who now delivers the lectures in this subject.

Agriculture.—A short course in Dairying has been included in the third year for the first time, but the lack of staff has made it impossible to attend to the Dairy work as one would wish, and as in other branches of Agriculture in this country, experiment and investigation should precede teaching. There is practically no accurate knowledge about dairying and dairy products, such as can be imparted to students, and until more staff can be spared, such knowledge cannot be obtained. Some additional machinery has been recently fitted, and the dairy offers an excellent opportunity for teaching and research, which at present cannot be taken.

The third year was taken as usual for two tours; the first in September included the Cauvery valley from Erode right down to the Tanjore delta, while the second was taken to see the Kangayam country and cattle; thence to Koilpatti to see the work of the department on the black soils there; and through Tinnevelly up the valley of the Tambraparni to Kuttalam. Palur was visited on the return journey. The value of these tours has recently been called in question: much depends on the arrangement of the tour and the energy of the teacher, but I am strongly of the opinion that, if properly carried out, they are of the greatest benefit to both the students and the staff who accompany them. Nothing is easier in farming than to get into a groove, and from the business point of view, if the groove is a good one, this is perhaps the wisest course, but it is fatal for teaching, and these tours undoubtedly prevent this. The students' plots which are cultivated each year by the second-year students have been rearranged: there is now a complete series in both wet and dry lands for them to occupy. As usual, the proceeds of their cultivation were divided between themselves as tenants, and Government as the land-holder on a varam system.

Teaching—Botany.—As usual this subject was taught to the first and second year students. The elementary botany course for the first-year men is intended to train them to understand the higher one in agricultural botany. During the year 58 lectures were given and 60 practical classes were held.

The second-year course in agricultural botany consisted of 60 lectures and 62 practical classes. The course included general ecology, general principles underlying the horticultural operations and the study of crops.

The diploma examination in botany was held in December 1912 and in this examination eight passed out of nine, one being placed in first class.

Mycology.—This year the course in plant diseases to the students was extended to three months and was given in the last term of the second year. On three mornings a week three hours were devoted to the study. The course which was mainly practical comprised the life history of a saprophyte and of a parasite, the general characteristics of fungi, the principal diseases of the more important crops of the Presidency and methods of prevention. The students are now in a position to observe a fungus disease on a crop, to choose suitable material and send it properly preserved for detailed examination in the laboratory, and to apply intelligently any preventive remedy suggested. An examination was held at the end of the term. Of the nine students who sat two were placed in the first class, two in the second and five in the third. Dr. Butler, Imperial Mycologist, was the external examiner.

Entomology.—The second-year students were put through a course in Entomology, under the Government Entomologist — three hours each week, of which two hours were devoted to practical field work and one hour to lectures. The examination for L. Ag. Diploma was held at the end of the year by Dr. L. C. Coleman, Director of Agriculture, Mysore State, with the result that, of nine students in the class, all passed, four being ranked as first class, four as second class and one as third class. As Dr. Coleman observed in forwarding examination marks, it was satisfactory to find that the students did better in the practical examination than in paper-work.

Chemistry.—During the year the first-year students received 50 lectures in Inorganic Chemistry, 41 lectures in organic chemistry and 58 classes in practical chemistry, the latter being of three hours duration each, and 32 classes in physics. The second year students had 62 lectures in agricultural chemistry and 29 classes in Practical Chemistry.

No change was made in the curriculum and the attendance throughout was very satisfactory, being 95 per cent. of the total possible.

5. *Examinations.*—Consequent on the increase of the time allotted to Mycology it was arranged that the examination in agricultural botany for the first part of the diploma should take place at the close of the second term in December. This had the double advantage of being more convenient for the students, and making it easier to obtain the services of an outside examiner, since in March examinations are generally in progress at other Agricultural Colleges. Mr. Woodhouse came from Sabour for the purpose and as a result of the examination, eight students passed and one failed. The examinations in the other subjects for Part I, Agricultural Chemistry, Mycology and Entomology were held in March, and it is satisfactory to record that all the students examined passed in all these subjects. As they have satisfied the Deputy Directors and myself as to their knowledge of agriculture, all the students proceeded to the third-year course; the one student who failed in agricultural botany being permitted to appear in this subject again. The outside examiners who appeared on the respective Boards of Examiners were as follows:—Agricultural Chemistry, Mr. Plyman; Mycology, Dr. Butler; and

Entomology, Dr. Leslie Coleman. The examination for the second part of the Diploma comprises the three subjects of Agriculture, Veterinary Science and Agricultural Engineering. In these subjects Mr. Milligan, Mr. Aitchison and Mr. Tressler assisted. Fourteen students appeared, and twelve passed; they received their Diplomas from the hands of the Director at a convocation held on the 29th March. Mysore has again come to the front—a Mysore stipendiary, C. Ellappa Chetti, carrying off the two principal medals: the Robertson Medal for Agriculture, and the Clogstoun Medal for general proficiency: the Keess Medal for chemistry was awarded to K. Raghavachari a student from Tanjore.

6. *Library.*—The increase in the expert staff has been followed by an increase in the number of books in the library, especially those dealing with Mycology and Entomology. During the year, 148 books which had been purchased by the Government Mycologist were transferred to the Library, while 392 were similarly transferred by the Government Entomologist. One hundred and fourteen were purchased in the ordinary way and 48 were received free. In addition to this, it was decided to devote a portion of a special non-recurring grant to the purchase of back numbers of some of the more important periodicals. One hundred and thirty back numbers of Die. Nat. Pflanzenfamilien, Botanisches Centralblatt, Beihefte Zun Bot. Central and Annals of Botany were purchased from Dr. Barber, and 69 were obtained from Messrs. Baker, a large number remaining unsupplied. The total number of additions was therefore over 900 during the year, and this necessitated a certain amount of rearrangement. It was decided to construct a series of lockers along one side of the library, to find room for all the loose unbound pamphlets and bulletins, which were unsuited for the big cases or for which there was not room. These are being received at the rate of over 1,000 a year, so that the need for additional space will certainly be felt before very long. The circulation of these periodicals was continued as usual.

One hundred and twelve books were bound at the Press at Ootacamund, and a further consignment was sent in February. For many reasons it is undesirable to send books away from the college, and it is hoped that the proposal to employ a whole-time binder for the library work will meet with approval.

The catalogue of pamphlets and bulletins is complete and is in the press; the work of proof correction is extremely tedious, and it will be a long time before it is ready for publication. The photographic collection was increased by the addition of fifty negatives.

7. *Students' Club.*—The finances of the Students' Club continue to improve. After the fitting of the new platform, it was decided to hold an entertainment, with the object of raising money for the club, and this entertainment, which came off in November last, proved most successful, a sum of over a hundred rupees being paid into the club funds. The thanks of the club are due to the support which was received from the members of the station and our friends in Coimbatore. The club finished the year with a balance in hand.

An old student, Dwarakanath, who carried off the Tennis Championship Cup, in virtue of having won it for three years in succession, has kindly presented a replica to serve as a Championship Cup: it has not yet been definitely settled what form the competition is to take. The club is also much indebted to the kindness of another old student, M.R.Ry. Vengail Krishnan Nayanar, who presented a Silver Championship Cup for the best athlete. This was won for the first time by Rajagopal Mal, who accordingly holds it for the year.

The Agricultural Students' Union prospered during the year, and serves a useful purpose in keeping past students in touch with the college: it also serves as an employment bureau for those of the men who desire employment. During the year, the union started a journal to be published quarterly.

The various celebrations by which College Day is marked are managed by the union, and include a conference, athletic sports and various social functions. Sir J. N. Atkinson, K.C.S.I., kindly presided at one of the conferences and further gave away the prizes.

8. *The Hostel.*—This continued under the management of the warden, an honorary post which was this year held by the Engineering Assistant M.R.Ry. R. V. Subramania Aiyar. He has many difficulties to contend with: the rise in the price of ghee and other commodities, the vexing question of the amount of chillies which should be included in the various dishes in order to suit all tastes, and until lately, the difficulty of the water-supply. The discipline and behaviour of the students have been excellent, and to him the credit for this is, I think, largely due. The mess worked at a slight profit during the year. A welcome extension was made in the hostel buildings by the construction of a new dining hall, connecting two kitchens. It is thus possible with this and two dining rooms opening from the other side of the kitchens to arrange for all the vegetarian meals to be cooked together.

9. *Sanitary.*—The health of the station continued good, and though plague threatened us in the villages around the farm, the precautions taken combined with the general sanitary condition in which the staff and their dependents are housed, the estate was kept free.

Further quarters are under construction and as noted above more are needed, while there are two more bungalows, so that sanitation work is on the increase. The Sanitary Inspector besides supervising the general cleaning of the Estate is responsible also for the lighting and for

the general upkeep of the road avenues and other small plantations, a work into which he has put commendable energy. Twelve births occurred during the year and nine deaths. One case of enteric was reported, but the disease spread no further.

The manufacture of poudrette is now organised, and the manure is found extremely valuable. The heaviest paddy crop raised this year was with the help of this manure, and for fodder crops, sugarcane or other crops where a luxuriant development of leaf is required, it is found to do very well.

The acquisition of the land at the south-east corner of the college gives more room for a sanitary depot, and the present huts occupied by the sanitary menials should be replaced by pucka houses, to which this useful class of servants are as much entitled as any other.

10. *The Farm.*—The season has again been a good one: it was characterised by rather a serious spell of drought in August and the beginning of September, and extremely heavy rains late in November.

There has been a general increase all round in the price of labour due to the numerous works proceeding in the vicinity; the Forest College is of course the most important of these. Prices of grains continued on the whole high, and most of the farm produce sold well: a system of weekly auctions was found effective in disposing of small quantities of miscellaneous produce.

A small district campaign was started by Assistant Farm Manager, W. Raghavachari, who visited some of the villages round, and was able to do some good work in the introduction of sunnhemp for green manure, and the reduction in the seed rate which can with care be effected in the paddy crop. The results were sufficiently encouraging to show that much good work could be done were staff available. I am myself extremely ignorant of the country even in the near vicinity of the farm, because I never seem to have any opportunity of getting out.

11. *Live-stock.*—The number of live-stock and their value continue to increase. Forty-six births and 43 purchases have increased, and 14 deaths and 24 sales have decreased the total which now stands at 246 instead of 195. A separation has been made between the working cattle and the breeding herd, the latter being attached to the dairy. Analyses have been made by the Government Agricultural Chemist of the milk of some of the cows, and data are gradually being accumulated from which it will be possible to differentiate the animals and breed only from the best. It is certainly unfortunate that the demands for men elsewhere render it impossible to make use of the splendid opportunities afforded by this large herd of cattle and the Dairy Building.

The Veterinary Assistant Mr. D'Silva moved into the new Veterinary Hospital in August. His relations with our neighbours continue excellent. The number of outside cases has again largely increased, both human and bovine; for almost any morning human patients may be seen waiting for slight injuries and so on to be treated. The fees instituted at the beginning of the year for service by the Farm stud bulls, were raised in June from four annas to eight annas, but seem to have caused no check on the number of animals brought: the fees realized during the year amount to Rs. 80.

12. *The Dairy*—has been running on semi-commercial lines for the past year, though the profit it can show is not very large. It has, as a matter of fact, very nearly paid its expenses, and there is little doubt that, if a man could be spared to manage it properly, and attend to the sales, and if due allowance were made for its educational value, a fair profit on the money invested could be shown. The bulk of the business done is naturally in whole milk, and to this, as much as to the water-supply and the general sanitation of the place, the good health enjoyed by the resident population may be ascribed.

The Equipment, which has recently been duplicated for teaching purposes, consists of two separators, an Alfa Laval and a Titan, two Churns, one the ordinary end over type, the other a Garbutt two minute churn, a butter worker, centrifugal butter drier and the rest of the usual Dairy Equipment. The total amount of milk handled during the year was 54,473 lbs. Neither teaching nor investigation, the latter a most important point considering our ignorance of dairying in this country, have been done justice to, and it says much for the energy of the Chief Assistant that he has been able in the short time during which he has only been able to spare his mornings at the Dairy to organise it so satisfactorily. It is earnestly hoped that a whole time man may shortly be spared for this.

13. *Staff.*—The teaching staff consists of a Professor in each subject with an assistant under him. In Agriculture, the Principal is the Professor and gives most of the lectures. His First Assistant, M.R.Ry. Chelva Ranga Raju, has charge of the practical work for the first two years and corrects their note books. This rather monotonous and thankless work, he has performed excellently. M.R.Ry. R. Ramaswami Aiyar has had charge of the third year, and their performance during the examination shows that his teaching has been sound. Latterly I have tried to arrange that the first Assistant should be able to spend every morning in the dairy and this until he went out into camp with the third year was a fairly satisfactory compromise. The teaching of Veterinary Science and Agricultural Engineering was entrusted to the assistants in those subjects. I am unable personally to criticize their work, but from the results of the examinations, which were conducted with the help of outside examiners, I am satisfied that they are on the right lines.

The executive staff have as usual been short-handed. One Manager and three Assistant Managers are not enough for a Farm of this size, if any experimental work is to be done. The experimental programme is being steadily reduced each year, and must continue to be until the duties of the executive are reduced. There are many opportunities for experiment here in almost every direction, which only need men to take them up. The Farm Manager, M.R.Ry. Balakrishtna Murti, as usual worked well, aud assisted me to no small extent in the management of the farm. He has been further responsible for the training of two new Assistant farm Managers, Nambiar and Seshachari, both of whom have worked under him satisfactorily throughout the year. A third new Assistant Farm Manager, C. Madiah, worked for a short time before leaving to take up work under the Court of Wards.

The increase in the amount of machinery on the Estate, has necessitated duplicating the post of mechanic, and since August the College Mechanic has been put in charge of the College well water-supply, all the College piping (water, gas, section and pressure), the clock, gas works, and, when it is installed, the electric light. The farm mechanic looks after all the farm machinery, engines, and implements, and the new pipe supply from the farm well.

I am also grateful for the increase in my office staff by the appointment of two extra hands. This has enabled better attention being paid to maintaining the records of the office. A financial statement is appended :—

Statement of receipts for 1912–13 *compared with* 1911–12.

Items.	Amount. 1912-13. Rs.	A.	P.	1911-12. Rs.	A.	P.
Botanic garden	146	0	4	131	2	6
Dairy	3,316	11	3	2,259	4	5
Farm—						
Sale of animals	895	12	0	320	0	0
Paddy	4,207	11	5	4,326	8	10
Cholam	3,057	0	7	2,383	5	2
Wheat	830	15	1	1,125	3	4
Ragi	1,548	3	0	1,390	10	11
Other cereals	810	9	7	1,167	5	11
Pulses	214	10	6	1,439	3	8
Cotton { Dry	1,682	13	7	2,348	10	11
Cotton { Garden	1,114	8	4	1,524	8	3
Other field produce	111	10	11	150	11	0
Usufruct of trees	547	0	10	106	11	10
Miscellaneous sales	874	2	1	1,310	1	10
Hire of implements	222	5	10	287	5	7
Total	19,580	3	4	20,270	14	2

Statement of charges of Farm for 1912–13 *compared with* 1911–12.

Items.	Expenditure during 1912-13. Rs.	A.	P.	1911-12. Rs.	A.	P.
Central Farm—						
Purchase of live-stock	4,425	5	1	1,845	0	0
Do. dead-stock	2,345	5	3	2,972	4	9
New works	3,891	6	0	1,168	2	1
Repairs and upkeep	7,944	15	6	7,431	0	8
Maintenance of cattle	6,793	8	10	6,726	8	6
Cooly labour	7,942	4	9	8,803	6	5
Sundries	287	2	6	548	11	2
Miscellaneous cultivation expenses	1,773	8	3	1,417	7	3
Seeds and plants	195	0	0	601	1	2
Manures and chemicals	1,188	15	3	1,582	10	8
Total	36,787	7	5	33,096	4	8

R. C. Wood,
Principal.

APPENDIX II.

THE ADMINISTRATION REPORTS OF THE AGRICULTURAL STATIONS DURING THE YEAR 1912–13.

Administrative Report of the Deputy Director of Agriculture, Northern Division.

I have the honour to submit the administration report of my division for the year 1912–13.

Staff.—I remained in charge of the division throughout the year. Three hundred and fourteen days were spent in camp; the farms at Hagari, Nandyal and Samalkota were visited 15, 12 and 13 times, respectively, and, besides the usual tri-annual visits paid to the Agricultural College at Coimbatore, the Mysore Government Farm at Hebble, the Military Dairy Farm at Bangalore and the Government Farm at Dharwar were visited. Tours were also made in the districts of Kistna, Gōdāvari, Vizagapatam, Chittoor, Kurnool, Bellary and Guntūr.

The Assistant Director of Agriculture M.R.Ry. D. Ananda Rao Garu joined this division from Coimbatore at the beginning of the year and after a short stay went on six months' leave. He rejoined on the 13th November 1912 and from that date spent most of his time in camp, visiting the farms and touring in the districts of Gōdāvari, Kistna, Guntūr and Kurnool.

District work.—Work was conducted in the same lines as in last year.

Cotton work.—During the year 75,000 lbs. of cotton seed were distributed from Hagari and Nandyal farms and from depots in Kurnool district, and 1,025 acres were sown down with selected seed from the farms—653 acres in Kurnool district and 372 in Bellary. A small quantity of seed was left unsold in Kurnool district where work has been going on longest, but at Hagari all the seed was sold.

Introduction of Cambodia cotton.—The demand for this seed was much greater this year and 6,362 lbs. were sold from Hagari farm to ryots in Bellary, Anantapur and Cuddapah districts, 4,500 lbs. from Nandyal farm, 492 lbs. in Kistna district and 696 lbs. in Gōdāvari district. In the last two districts the growing of this crop is still in the experimental stage and it is not expected that the spread of the crop will be very rapid as only a little cotton is grown in these districts and the ryots are not familiar with cotton as a crop; in the other districts it is not expected that there will be much further demand for seed as the crop has now been grown on a large enough scale for all demands to be met by local scale.

Sugarcane—(1) *Distribution of canes*—The demand for canes was small. B. 208 is not liked by the delta ryots and Red Mauritius is not so badly diseased as to warrant a fresh cane being distributed. Altogether 614 canes were distributed from Samalkota farm.

(2) *Improvements in cultivation.*—In Gōdāvari district 66 ryots planted canes in rows over an area of 70 acres. The practice is spreading in the neighbourhood of two villages, but elsewhere in the district progress is slow. The smaller area planted this year is, however, mainly due to the decrease in the area of sugarcane under cultivation due to the fall in the price of jaggery.

Paddy—(*a*) *Improvements in cultivation.*—In Gōdāvari district 15 ryots sowed thin seed-beds, the area so sown being 5·94 acres and 252 ryots transplanted single seedlings over an area of 524 acres of which a large proportion was planted without any assistance or persuasion from the farm officers, the ryots having been satisfied with the trial they made last year.

In Chittoor district a start was made with the introduction of this practice and a few ryots were induced to try it on a small scale with on the whole successful results. At Nandyal the demonstration plot was maintained, but as yet there are no signs of the practice being taken up by the ryots of the neighbourhood.

(*b*) *Seed distribution.*—3,578 lbs. of Garikasannavari seed were distributed from Samalkota farm for the present second-crop season and up to date 12,729 lbs. of Konamani and 4,890 lbs. of Rasangi for the coming main-crop season.

Green manure.—The work of distributing green-manure seeds has increased. Altogether about 11,800 lbs. of seeds, chiefly sesbania, were distributed mostly in Chittoor and Gōdāvari districts.

Implements.—A gallows plough, Ransome Sims and Jefferies S.A.E., has been obtained for Nandyal farm and will be tested for use on black-cotton soil.

The Bellary Agricultural Station.

The proposals put forward for the closing of this farm were accepted by Government and work ceased here from the 30th June 1912. Farm Manager Raghunatha Rao was in charge from the beginning of the year until the farm closed.

Hagari Agricultural Station.

Season.—The rainfall was in excess of requirements and had it not been for the rains received in November exceedingly good yields would have been obtained from both cotton and sorghum. As it was the cotton crop was spoilt and the yield of sorghum was lowered by insect attack, the wetter season being favourable to the multiplication of these pests.

Crops—Korra (Setaria Italica).—This crop has done very well this year. As a mixed crop an average yield of 711 lbs. of grain and 923 lbs. of straw was obtained as compared with 107 lbs. of grain and 190 lbs. of straw obtained last year; the total area of mixed crop this year was however only 75 cents. As a pure crop the average acre-yield was 428 lbs. grain and 423 lbs. straw as compared with 158 lbs. grain and 497 lbs. of straw last year. The total area of pure crop was 9·14 acres the greater part of which was land considerably poorer than that on which the mixed crop was grown.

Cotton.—The yields taking the whole area into account were exceedingly poor this year. The late rains caused a great deal of leaf and flower fall and this threw the crop back badly. As a mixed crop a yield of 136 lbs. of kappas per acre was obtained, better than last year when the season was too dry and when an average yield of 77½ lbs. per acre was obtained. As a pure crop the average acre-yield was 182 lbs. of kappas, that the average is as high as this is due to the good yields obtained from fields Nos. 6 and 8 both of which were well farmed by their previous owners, the former was sown down with type No. 1 and gave an average yield of 306 lbs. of kappas per acre, and the latter was sown down with bazaar seed and gave 445 lbs. of kappas per acre. Both fields were 5 acres in extent. Last year the average acre-yield for the pure crop was 367 lbs.

Sorghum.—As stated above the crop suffered from insect attack, the yields however are about average. As a mixed crop with Bengal gram an average yield of 607 lbs. grain and 1,833 lbs. of straw per acre was obtained from three experimental plots. As a pure crop an average acre-yield of 635 lbs. grain and 1,609 lbs. straw were obtained from four experimental plots and from the whole area under pure sorghum 535 lbs. grain, 1,219 lbs. dry fodder and 311 lbs. of green fodder, the yields last year being respectively 25 lbs., 700 lbs. and 294 lbs.

Bengal gram.—The heavy rains were favourable to this crop and made it possible to grow it as a second crop after Italian millet. As a mixed crop with sorghum as grown locally, viz., one line in six of the sorghum crop being a mixture of gram and sorghum, the small yield of 16 lbs. per acre was obtained. As a pure crop sown at the normal time over an area of 11·86 acres it gave an average acre-yield of 445 lbs., the best yield being 709 lbs. per acre being obtained from field No. 5 from an area of 3·6 acres. As a second crop after Italian millet the yield was naturally lower, an average acre-yield of 161 lbs. being obtained from an area of 9·9 acres.

Garden crops—Ragi.—This crop was grown in field No. 2 of the garden and has given an average acre-yield of 2,396 lbs. grain and 4,085 lbs. straw.

Sugarcane.—The crop was not very good and is still being harvested.

Tobacco.—This crop grew fairly well and has given an average acre-yield of 1,002 lbs.

Onions.—The crop was a fair one and has yielded at the rate of 11,487 lbs. of bulbs per acre.

Sweet-potato.—The crop was not very good; it suffered from excess of moisture in the monsoon and just before harvest was attacked by weevil. An average acre-yield of 7,882 lbs. was obtained.

Cambodia cotton.—Only a very small quantity of kappas was obtained as a second picking from this crop last year and it is doubtful whether any will be obtained this year. The yield for the first picking was at the rate of 605 lbs. per acre.

Groundnut.—The crop was poor, only 937 lbs. of pods being obtained per acre.

Distribution of seed—

	LBS.
Local cotton	5,285
Cambodia cotton	6,362
Green-manure seeds	100
Miscellaneous	270

Sheep.—At the beginning of the year the flock consisted of eighteen individuals—ten ewes, seven ewe lambs (over six months' old) and one ram lamb—dropped during the hot weather. One ewe lamb died and one ram was purchased. The flock has been increased by ten lambs dropped during this last cold weather.

Staff.—Farm Manager S. Ramaswami Pillai was in charge of the farm till 7th June 1912 when Farm Manager L. S. Natesa Aivar was given charge who continued till 1st September 1912 when Farm Manager S. Ramaswami Pillai was again placed in charge of the farm and district work and Farm Manager L. S. Natesa Aiyar continued assisting in farm and district work. Farm Manager T. V. Rajagopalachari was at the farm from 1st April till 16th May 1912 when

he went on privilege leave and rejoined on 16th June 1912 and left for Patimannu work on 22nd June 1912. Farm Manager V. S. Narayanaswami Aiyar who joined this farm from Coimbatore on 17th May 1912 left for Chittoor on 14th June 1912.

Assistant Farm Manager V. S. Ramaswami Aiyar who joined this farm on 15th June 1912 left on 3rd October 1912 on transfer to Nandyal.

Assistant Farm Manager T. S. Venkatarama Aiyar joined this farm on 3rd October 1912 and continued to the end of the year.

Assistant Farm Manager G. R. Venkatachelapathy joined this farm on 18th March 1913 and continued to the end of the year.

Receipts.	Rs.	A.	P.	Charges.	Amount. Rs.	A.	P.
				Experimental Farm and Cultivation—			
Civil works ...	67	8	0	A. Capital Charges—			
Sale of farm produce.	2,916	8	8	1. Moveable—			
				(a) Purchase of livestock ...	...		
				(b) Purchase of deadstock ...	334	15	8
				2. Immoveable—			
				New Works	171	13	4
				B. Working Expenses—			
				1. Repair and upkeep of all kinds ...	1,089	4	2
				2. Maintenance of cattle	478	2	7
				3. Cultivation expenses—			
				(a) Cooly labour	1,376	7	1
				(b) Hire of cattle and drivers ...	...		
				(c) Miscellaneous cultivation expenses	426	6	8
				4. Seeds and plants	105	7	9
				5. Manures and chemicals	97	6	8
				6. Sundries	221	4	3
	2,984	0	8	Total ...	4,301	4	2

Nandyal Agricultural Station.

Season.—The rainfall like last year was below the average, but unlike last year, when the opposite was the case, its distribution was more in favour of sorghum than cotton, though until late in November the season appeared to be going to be another good one for cotton and bad again for sorghum. The late rains received then however completely altered matters, the cotton crop was spoilt and sorghum from being an utter failure recovered so well that it has given very good yields.

Crops—Sorghum.—Twenty-two acres were sown down with this crop this year and have given an average acre-yield of 433 lbs. of grain and 1,394 lbs. of straw as against last year's yield of 420 lbs. of grain and 1,920 lbs. of straw. The best yield was obtained from a 25-cent plot grown from seed obtained from Pulimaddi, the yield calculated per acre being 920 lbs. grain and 2,200 lbs. straw.

Korra (*Setaria Italica*).—This crop was sown down in the area newly acquired on an extent of 39½ acres and has given an average acre-yield of 117 lbs. of grain and 90 lbs. of straw.

Bengal gram (*Cicer Arietinum*).—This crop was grown as a main crop on an area of 5½ acres and gave an average acre-yield of 350 lbs. of grain and as a second crop after korra on an extent of 21½ acres and gave an average acre-yield of 60 lbs. of grain.

Cotton.—Picking of this crop is still in progress and the full returns are not to hand.

Seed distribution.—

	Lbs.
Local cotton	70,000
Cambodia cotton	4,500
Green-manure seeds	750
Sorghum	497

Two sets of Ceded districts implements (gorru, guntaka and danthalu) were supplied to two applicants.

Staff.—Assistant Farm Manager T. S. Venkatarama Aiyar continued in charge of the farm till October 1912 when he was transferred to Hagari and Farm Manager M. Raghavalu Nayudu who took charge from him continued to the end of the year.

Assistant Farm Manager V. S. Ramaswami Aiyar joined this farm on 7th October 1912 and continued to the end of the year.

Receipts.	Rs.	A.	P.	Charges.	Amount. Rs.	A.	P.
				Experimental Farm and Cultivation—			
Sale of farm produce.	1,031	11	10	A. Capital Charges—			
				1. Moveable—			
				(a) Purchase of livestock ...			
				(b) Purchase of deadstock ...	2,948	8	3
				2. Immoveable—			
				New Works	672	7	9
				B. Working Expenses—			
				1. Repair and upkeep of all kinds ...	155	9	1
				2. Maintenance of cattle	124	4	8
				3. Cultivation expenses—			
				(a) Cooly labour	238	6	5
				(b) Hire of cattle and drivers ...	13	8	0
				(c) Miscellaneous cultivation expenses	93	15	7
				4. Seeds and plants	75	0	6
				5. Manures and chemicals	71	9	3
				6. Sundries	89	14	2
	1,031	11	10	Total ...	4,483	3	8

Samalkota Agricultural Station.

Season.—The rainfall was below the average and was unfavourably distributed. At the beginning of the season the rains held back and both wet and dry crops suffered. Later however matters improved and good crops were obtained in the deltaic area.

Crops—Sugarcane.—This crop was got in, in good time and, though at first progress was poor, it improved later and gave good yields. The average acre-yield of raw-sugar from the area crushed was 9,367 lbs. as against 6,138 lbs. obtained last year. The best yield 44 candies, *i.e.*, 22,000 lbs. was given by J. 247 in field No. 28.

Red rot was very little in evidence and it is calculated that less than 5 per cent. of the canes were diseased.

Paddy.—This crop did very well this year and most of it lodged owing to the weight of the ears. The average acre-yield for the whole area under this crop for the main-crop season was 3,586 lbs. grain and 5,278 lbs. straw as against 2,352 lbs. grain last year. Rasangi on an area of 3·77 acres, Konamani on 15·66 acres and Ratnachudi on 2·24 acres gave average acre-yields of 4,459 lbs. grain and 5,450 lbs. straw, 3,498 lbs. grain and 5,465 lbs. straw, and 2,793 lbs. grain and 3,938 lbs. straw, respectively, the highest yield of grain 4,960 lbs. per acre being obtained from a 20-cent plot of Rasangi in field No. 10.

Smut was present but not to such a large extent as last year and as usual Ratnachudi was the variety most severely attacked.

Green-manure crops.—Sesbania, teegapesalu (Phaseolus Mungo) and sunnhemp were as usual grown as ante-monsoon crops for green-manuring paddy. All three thrive best when sown in April–May, the last-named failed entirely when sown in the standing crop of paddy. As regards sesbania, a few stems which had escaped being trodden in were noticed floating about the paddy fields. On examination it was seen that roots were being produced at one of the nodes and later on the stem was found firmly rooted and sending up a new stem which bore flowers and produced seed. This has suggested the making of cuttings at the time of puddling, to be stuck in the ground near the edge of the field, to obtain a supply of seed for the next year's sowing. If successful, the adoption of this practice ought to go a long way towards the solution of the difficulty of seed supply.

Dry and other crops.—Turmeric, dry paddy, red-gram (*Cajanus indicus*) and Cambodia cotton were grown on the dry area.

Turmeric grew fairly well and has given an average acre-yield of 8,186 lbs. green weight as against 10,306 lbs. obtained last year.

Dry paddy was adversely affected by the droughty conditions which prevailed in the earlier part of the season and the yields this year were on the whole poorer. The average acre-yield was 1,000 lbs. grain as against 911 lbs. grain obtained last year. White budama gave the best return, yielding at the rate of 1,805 lbs. grain from a 20-cent plot.

As in last year Cambodia cotton was sown down in plots to discover what is the best season in which to sow it. The yields for this year are not yet to hand; last year the best yield was obtained from the plot sown on the 1st of June 1912.

Experimental work.—The experimental plots were maintained, but no new experiments were added during the year under report.

As a result of the experimental work done it has been concluded—

(1) That the local method of planting sugarcane on the flat is satisfactory and that the practice of trenching is no improvement on it.

(2) That the omission of the operation of puddling in the cultivation of paddy leads to a weedier field and a reduced yield.

(3) That the planting of paddy seedlings singly is more economical than planting by twos.

(4) That the use of ammonium sulphate alone as a manure for paddy is not economical.

In accordance with these conclusions these experiments will be discontinued.

Seed-distribution.—The following quantities of seed were distributed during the year:—

	LBS.
Paddy—	
Konamani	12,729
Rasangi	4,890
Garikasannavari	3,578
Other varieties	522
Green-manure seeds—	
For the main crop season of 1912–13	1,552
Do. 1913–14	3,125
Sugarcane	614 canes.

Staff.—Farm Manager V. Muthusami Aiyar remained in charge of the farm throughout the year and also attended to district work. Assistant Farm Manager Seetharamasami Nayudu continued to help him and five other Assistant Farm Managers remained for longer or shorter periods at the farm.

Receipts.	RS.	A.	P.	Disbursements.	RS.	A.	P.
Civil works ...	134	4	0	Experimental Farm and Cultivation—			
				Moveable—			
				Purchase of livestock	140	0	0
				Purchase of deadstock	483	10	6
Sale-proceeds ...	3,272	3	11	Immoveable—			
				New Works	48	13	8
				Working Expenses—			
				Repairs and upkeep	1,173	2	3
				Maintenance of cattle	374	2	3
				Cooly labour	1,622	11	8
				Hire of cattle and drivers	3	12	0
				Miscellaneous cultivation expenses ...	666	7	0
				Seeds and plants	134	10	9
				Manures and chemicals	315	13	7
				Sundries	409	14	0
				Total ...	5,373	1	8
Total ...	3,406	7	11				

G. R. Hilson,
Dy. Director of Agriculture, Northern Division.

Administrative Report of the Southern Division for 1912–13.

I have the honour to submit the Administration Reports of the Agricultural Stations under my charge.

The Southern Division was in charge of Mr. H. Southern, Supernumerary Agriculturist, until 30th April 1912, when he was permanently transferred to the Punjab as Deputy Director of Agriculture. Mr. Southern handed over charge to Mr. K. Ramasastrulu Nayudu, Assistant Director of Agriculture, on 30th April 1912, who acted as Deputy Director of Agriculture until 19th June when I resumed charge. From July 8th Mr. K. Ramasastrulu Nayudu again acted for me until October 28th, from which time I have remained in charge until the end of the period under report.

The opening of a new Agricultural Station in this division and providing staff for it, made it necessary to considerably restrict district work in the neighbourhood of the Agricultural Stations.

Besides this, two Farm Managers were transferred from this Division, one to work under the Government Sugarcane Expert and the other as 3rd Assistant to the Government Entomologist. Every effort, however, was made to maintain such district work as had already been organised and considerable progress was made in the introduction of green manure crops into the Periyar tract. Considerable difficulty was felt in obtaining seed of green manure crops, partly because arrangements were not made sufficiently in advance to obtain seed, partly owing to the short supply of seed owing to the season and partly owing to competition with private parties who wished to obtain seed for their own use or for sale. This private competition to obtain green manure seed is sufficient testimonial to show that there is a considerable spread in the practice of green manuring.

The work of cotton improvement was carried on in Tinnevelly on very similar lines to those laid down in preceding years, viz., the cultivation of cotton for seed by ryots under the direction of the Department; the purchase of kappas, ginning and subsequent distribution of seed to ryots through village depots, the introduction of improved methods of cultivation. The following are the areas sown with the drill during the last three years :—

—	1910–11.	1911–12.	1912–13.
	ACS.	ACS.	ACS.
Cotton	1,549	2,757	2,733
Cumbu	70	818	1,040

These figures show a slow but steady improvement, but what shows a more rapid advance is the sale of implements of which 14 sets including seed-drill, bullock cultivator, and bullock hoes were sold during the year.

Up till last year, it was found that the distribution of a limited quantity of pure Karunganni cotton seed in one village meant that within a very short time, the whole village was sown with that strain. The ryots would sell to the Porai or *local* hand ginning shed where all the cotton of that village and possibly one or two surrounding villages would be ginned. But with the introduction of Cambodia cotton and the improvement of the cotton of the south of this tract, several new ginning factories, some small and some large, have sprung up, to which the dealer now takes his kappas to be ginned instead of having this done by hand gins in his own village. The result has been that instead of the dealer returning the seed obtained from any one village to that village, he returns the mixed seed obtained from the ginning factory, which, besides being mixed, is often considerably damaged by becoming wet and by heating when stored in bulk. Thus two courses are open to the Department if they wish to maintain the improvement already made in the Tinnevelly cotton. Either a policy of distributing seed year after year in very large quantities, or to distribute small quantities as heretofore and to induce the ryots of a village to co-operate and to send their kappas raised from this seed direct to the factory and take their own seed back, thus doing away with the middleman and obtaining reliable seed sufficient for their requirements the next year.

The second method has many advantages and is the one which is being adopted. It means that the work can expand without increasing the departmental staff; that the same care and supervision can be given to the seed farms, and what is most important, that the improved selected strains of cotton which are being raised on the Koilpatti Agricultural Station can be utilised to the best advantage and can be sent to certain picked villages of good cultivators.

Attempts in the above direction are being made. Several villages have promised thus to co-operate, but it yet remains to be seen whether they will fulfill their promise.

On the West Coast the district work which is done by the staff of the Taliparamba Agricultural Station and which is mainly confined to the introduction of improved varieties of sugarcane and better methods of preparing jaggery, has made considerable progress. Sugarcane is a new crop to Malabar; yet now there is a fairly large area grown, the permanency of which is indicated by the fact that three iron mills have been purchased within the district. In South Canara where the sugarcane crop is of old standing, the new canes have been readily taken up. Iron mills have been introduced as well as improved furnaces and boiling pans. With these latter a very great saving has been effected in the cost of manufacture. Formerly large quantities of fuel were required for boiling the juice, but now the megass alone is more than ample. This heavy demand for fuel had the effect of limiting the area and now with the better and heavier cropping cane, the iron mill, and the improved furnace, there has been very considerable expansion of cane cultivation. It has been reported also that the canes introduced into the north of South Canara have been sold in considerable quantity to North Canara for planting.

The general demand for green manure seeds, especially those of wild indigo, has this year been much greater than could be supplied and already arrangements have been made for a very large increase of the supply of this seed for next year. The demand outside the Periyar tract has been mainly from Chingleput, South Arcot, Tanjore and the Cauvery valley.

Correspondence in my office has again shown considerable increase. Besides the opening of a new Agricultural Station which has added considerably to the routine correspondence, 2,113 letters have been received from private correspondents applying for advice, seeds, etc.

The Koilpatti Agricultural Station.

Season.—The rainfall for the year has been 34·14 inches. This is much above the average and on the whole was well distributed. The summer picking of kappas, *i.e.*, the second flush of cotton after the hot weather showers, gave about 27 per cent. of the quantity harvested from the main or season picking. This greatly helped the district where the season picking in 1911–12 was very light.

Some difficulty was experienced in sowing the north-east monsoon crops on the black soils owing to incessant wet weather; while the growth of crops already sown was greatly checked. The result was that the cotton crop throughout this tract was much later than usual. The quality, however, of the cotton is exceptionally good. The Chola-nattu or fodder cholam gave an exceptionally heavy yield. This crop is always sown very thickly and usually suffers from insufficient rainfall. The yield of cumbu, the main cereal of the black soil, was low throughout the district, as it was not possible to intercultivate the crop in proper season.

The crops on the red soil, owing to the very poor natural drainage of that block, suffered very severely from the heavy rains of the north-east monsoon and for more than a month no field operations were possible. The fields became very foul with weeds which nearly choked many of the crops whose growth was already checked by the incessant rain.

Black-soil crops.—The work of the improvement of the Tinnevelly cotton crop has now reached a stage when the results of seed selection work are now bearing fruit. Last year three single plant selections had reached a stage when they could be grown on a field scale and of these it was decided that one of them could now be put on to a seed-farm. Accordingly arrangements were made with a ryot of the adjoining village to grow 20 acres of this selection for the Department for seed. This has done exceptionally well; not only is the crop bearing heavily, but it is giving a cotton of excellent quality which Mr. Steel of Messrs. A and F. Harvey & Co., who has an expert knowledge of Tinnevelly cotton, values at at least ½*d.* per lb. above F. G. F. Tinnevellis. Not only this; but the strain ginned at 28·25 per cent. against the 25 per cent. average of the district. This selection excels in yield, quality, and percentage of lint to seed, and is admitted to be the best crop in the village. Many ryots are anxious to obtain seed of this next year. This opens up a splendid field for village co-operation. The ryot is always careless of his seed, but in the neighbourhood of the Agricultural Station the adjoining villages are now learning the value of good seed and it may be estimated that this strain will bring in an increased value of crop worth, at present prices, at least Rs. 16-4-0 per acre estimated as follows:—

	Rs.	A.	P.
Increase in yield, ¼ pothie (61 lbs.)	7	8	0
Increased value of kappas due to higher ginning percentage ...	5	0	0
Increased value of cotton due to better quality	3	12	0
Total ...	16	4	0

Of this Rs. 16-4-0, without co-operation, the ryot would not get more than about Rs. 12; while there is no reason why with co-operation, he should not make at least Rs. 20, since the seed obtained from such a crop would have a much higher value for seed purposes when once the existence of such an improved strain became known in adjoining villages.

Thus, in this one village which grows 750 acres of cotton a year, on this basis, the value of the introduction of such an improved strain would be Rs. 15,000 per annum.

This year 6 strains of single plant selections are being grown on a field scale and it is probable that at least two of these will next year be grown on seed farms for seed. There are very marked differences in these selections both in habit and in the time of ripening, and it is hoped that this will lead to an extension of the area under Karunganni cotton which has up to the present been limited to the south-east of the Tinnevelly tract. In the north and west of the tract, the season for sowing is earlier, and hence a cotton is required, which, like Uppam, will ripen its crop early and all at one time. One at least of these 6 strains should suit this tract. In the south of the tract where the sowing season is much later and where the crop usually has to mature its season crop without the aid of any rain after sowing, a strongly drought resistant strain which does not exhaust itself with ripening uniformly is wanted. At least two and probably three of these strains will suit this tract. The others are intermediate strains which will suit the centre of the Tinnevelly tract.

To follow the work a stage further back, there are this year 8 field plots varying in size from 5 to 10 cents, where the produce of the crop from a single plant selection is tested under field conditions. One of these promises to turn out very well as a strain for the north of the tract. The quality of the kappas is better than anything yet produced under field conditions on the Agricultural Station, while the yield is very heavy and the ginning percentage should be well over 30 per cent. Carrying the work still a stage further back, there are 28 plots sown with the produce of single selected plants of the previous year, from which further single plant selections will be made for next year's sowing and bulk selections will be made for cultivating as field plots.

Besides this line of selection work, a general selection is made every year from the bulk crops of the farm. The seed thus obtained has been sown separately and the next season this area supplies the whole seed supply for the Agricultural Station. The result has been a very great improvement in the ordinary Karunganni crop grown on the Station and as the Agricultural Station supplies seed to the seed farm, there has been a very much greater demand for "company" seed, as the yielding properties of this cotton have been developed and become known. The improved strain thus produced now shows so much improvement that the work of selection to supply seed for farm sowing the next year is now confined to the one field where the previous year's selections are sown.

Selection work with cumbu has made no progress during the year. In order to prevent cross fertilization which appears to be the rule with this crop, single plant selections were this year sown in lines through a crop of fodder cholam, a space of 6 feet being left for two lines of cumbu. These, however, received a severe check at the outset owing to the incessant rains of November and subsequently seem to have been affected by the vicinity of the cholam. These made no growth at all and never set any seed.

Fodder cholam crops were all very good, especially those of the Coimbatore Periamanjal variety. Attempts to grow cholam as a grain crop are not yet successful. Certainly a higher yield of grain per acre was obtained from these trials than from cumbu, but the major portion of the grain was either destroyed by plant bugs or by the sugar disease of cholam and the crop by no means fulfilled the promise which they gave in their younger stages. Attempts to improve this are being made by selection and several single plants were this year selected. The points which were looked to when selection was made were (1) a loose open panniele which would not give cover to plant bugs; and (2) large enclosing glumes which would protect the seed from their ravages.

The Red-soil block.—Owing to the nature of the season very little experimental work was possible. A commencement has, however, been made to improve Cambodia cotton by selection.

There being a heavy demand for onion seed (the variety which is grown from seed was introduced by the Department in 1907), as large an area as possible was put under this crop for seed to meet this, as it has been found that purchased seed is very unreliable in quality. Last year the seed was purchased and the supply available was so scarce and the demand so keen that ryots were prepared to pay Rs. 6 per Madras measure for seed.

Improvements and new works.—The Department in charge of well boring and pumping installation operations made a boring in one of the wells in the red-soil block and struck fairly good spring at 50 feet below the bottom of the well, *i.e.*, 72 feet from the surface. This up to the present is sufficient to keep one mhote going all the time.

An existing building originally intended for a silohouse has been altered into a ginning shed and an engine room has been built on to it. The work was not quite completed at the end of the year. Two gins will ultimately be fitted up and it is hoped that this will deal with all the kappas which is purchased from our seed-farms.

The work of revetting the odais or drains on the black-soil block has been continued, though there is still work for three or four more years before this will be completed and the fields properly protected from surface wash.

Staff.—Farm Manager, M.R.Ry. M. Mangesha Rao, was in charge of this Agricultural station until 28th October 1912 when he was transferred to Coimbatore for work on the new Sugarcane station. After this, Farm Manager, M.R.Ry. A. V. Tirumuruganatham Pillai, resumed charge over the Agricultural Station as well as being in charge of the green manure work in Madura. One senior and one junior Assistant Farm Managers were transferred to this Argicultural Station from Palur and Manganallur respectively, and a senior Farm Manager was transferred from here to Manganallur. Three junior Assistant Farm Managers who joined the Department during the year were drafted to this Agricultural Station for further training in farm management and district work and one senior Assistant Farm Manager has been temporarily transferred to Madura district for work in connection with the introduction of green manure crops.

General.—Five bullocks were purchased during the year to replace old animals and those killed during the cyclone last year. This Agricultural Station continues to attract large numbers of visitors and it is gratifying to note that the majority of these are ryots from the Tinnevelly black-cotton soil. Many of these come to the officers attached to the Agricultural Station for advice and many of the improvements which the Department can recommend from the results of trials on this station are being adopted in the district.

Receipts.			Charges.			Amount.		
RS.	A.	P.				RS.	A.	P.
			Experimental Farm and Cultivation—					
Civil works. 70	8	0	A. Capital Charges—					
			1. Moveable—					
			(*a*) Purchase of livestock ...	...		625	0	0
			(*b*) Purchases of deadstock ...	...		24	12	1
Sale of farm 3,127	12	2	2. Immoveable—					
produce.			New Works ...	...	...	1,050	7	5

Receipts.			Charges.		Amount.		
RS.	A.	P.			RS.	A.	P.
			Experimental Farm and Cultivation—*cont.*				
			B. Working Expenses—				
			1. Repair and upkeep of all kinds	...	640	7	8
			2. Maintenance of cattle ...	...	712	14	3
			3. Cultivation expenses—				
			(*a*) Cooly labour	...	1,494	3	1
			(*b*) Hire of cattle and drivers	...	10	0	0
			(*c*) Miscellaneous cultivation expenses	ex-	246	14	11
			4. Seeds and plants	...	189	1	1
			5. Manures and chemicals ...	...	278	14	6
			6. Sundries	...	40	6	9
3,198	4	2		Total ...	5,313	1	9

The Manganallur Agricultural Station.

This station was started at the commencement of the period under report.

The season.—Although the rainfall was very much below the average, the season may be said to have been on the whole very favourable.

Crops.—The main crop grown on this Agricultural Station is paddy, and in order to gain experience of the local conditions, no experimental work was commenced this season. The cropping, however, was arranged so that a start could be made next year with seed selection work, and green manuring was tried on a general scale. The results of this latter treatment are dealt with in the annual report of this station.

Buildings.—The work of erecting buildings was commenced previous to the opening of the Agricultural Station and all those proposed were erected before the end of the year, viz., cattle sheds, office and store room, inspection bungalow, quarters for the Farm Manager, masonry stands for storing grain in bulk. Besides this, the existing buildings which were included in the lease were all put into thorough repair. The total cost of these works was Rs. 5,675.

Staff.—Farm Manager, M.R.Ry. C. Narayana Aiyar, who had been posted to this district for district work since November 1908, was in charge of this station from 15th February until 1st November 1912, when he was, owing to failure of health, transferred to the post of third Entomological Assistant at Coimbatore, and I wish to record here the good work which this officer has done both in the district where he was generally known as the "Single seedling Iyer" and on the Agricultural Station where he had charge of the erection of all buildings, of organising labour, etc. After his transfer, the Agricultural Station has been in charge of Farm Manager M.R.Ry. K. Sankara Aiyar who was posted to this Station as Assistant Farm Manager on 6th July 1912. He was assisted by Assistant Farm Manager K. T. Bhandary who joined the Department in 29th August 1912. No district work has this year been possible as the Agricultural Station fully employed the staff which, owing to shortage of subordinate officers, was not up to its full strength.

Receipts.			Charges.		Amount.		
RS.	A.	P.			RS.	A.	P.
			Experimental Farm and Cultivation—				
Civil works. 30	8	0	A. Capital Charges.—				
Sale of farm produce. 741	3	5	1. Moveable—				
			(*a*) Purchase of livestock ...	...	...		
			(*b*) Purchase of deadstock	...	65	1	9
			2. Immoveable—				
			New Works	...	2,820	11	10
			B. Working Expenses—				
			1. Repair and upkeep of all kinds	...	335	14	2
			2. Maintenance of cattle ...	...	641	4	5
			3. Cultivation expenses—				
			(*a*) Cooly labour	...	1,357	10	2
			(*b*) Hire of cattle and drivers	...			
			(*c*) Miscellaneous cultivation expenses.	ex-	326	1	3
			4. Seeds and plants	...	183	6	10
			5. Manures and chemicals ...	...	326	0	7
			6. Sundries *	...	3,661	7	2
771	11	5		Total ...	9,717	4	2

* Includes rent.

The Palur Agricultural Station.

Season.—Though the total rainfall for the year, viz., 41·95 inches was not much below the average, the distribution was bad. This is a district where both monsoons are necessary for the agriculture of this tract, *i.e.*, a well-distributed rainfall from June to December. Yet, out of this total rainfall, 38·55 inches fell in the four months from August to November, 17·05 inches of which fell in the second half of November. Thus it can be seen that the hot weather irrigated crops received no help from the season, while the sowing of the rainfed cereals was delayed until the beginning of August instead of being sown in the end of June. This long period of dry weather (from January to July) seriously affected the water-supply in the channels and the Agricultural Station further suffered by the new arrangements for water distribution which were made this season by the Revenue authorities. The result was that the cane crops practically failed and all the experimental work with the first crop of paddy was, for the season, rendered useless. The rainfed cereals, except tenai which failed, fared better than was expected and cumbu gave very fair yields. The rainfed groundnuts also gave very fair yields, though they suffered slightly from inundation during the heavy rains of November. The samba paddy was good throughout. The crop benefited much from the heavy rains of October-November and gave the highest average yields yet obtained. One or two low-lying fields which were entirely submerged soon after planting were, however, slightly damaged.

Rainfed crops.—Owing to the abnormal nature of the season as above mentioned, these crops were sown late and little reliance can be placed on this year's results.

Crops on garden land.—Unfortunately at the commencement of the season, one of the two wells on which this area is dependent for irrigation fell in and the whole area was thus dependent on one well which was quite inadequate. This suffered in consequence, the yields obtained were all poor and the results are too unreliable to draw any conclusion from.

Crops on wet land.—Great difficulty was experienced in getting water to plant the cane crop. This as usual was planted in a nursery from which it should have been planted out when water was received in the channel. However, water was not available at the right time and the crop was not planted until June when the young plants were really too old to transplant. Two varieties failed entirely, while none of the others made a full stand.

Similarly the first crop paddy seedlings had to be left in the nursery far too long as no water was available for planting and the yields obtained only averaged 1,488 lbs. per acre against an average of 2,125 lbs. for the three preceding years. Some of the first season varieties under trial have, however, yielded well in spite of the short water-supply and other disadvantages, but these take too long to mature as a first crop. They would, however, probably be useful on land irrigated by tanks which fill in the south-west monsoon. The introduced varieties all show a tendency to take a longer time to mature than when they were first introduced. The samba crop paddy was good and yielded on an average 2,119 lbs. per acre against an average for the preceding three years of 1,811 lbs. This has largely made up for the loss on the 1st crop, the total yield on the Agricultural Station for both crops being 38,719 lbs. against last year's figure of 40,030 lbs. Here again there was difficulty in getting water to transplant the crop in proper season and short duration varieties suffered accordingly from the seedlings being too old. In double crop lands water was very scarce at the time of the filling of the ears of the second crop and the yields from these fields consequently suffered. An experiment has this year been started to see how far it is necessary to supplement a green manure crop which has been ploughed in with the other manurial ingredients which are not supplied by the green manure crop, but so far as this year's results go, the land does not yet show any need for supplementing the green manure crop. This seems to indicate that the value of a green manure crop is very largely due to its mechanical action.

Seed distribution.—The seed distribution from this Agricultural Station has been as follows :—

	LBS.
Paddy	7,072
Groundnuts	4,863
Miscellaneous	628

In addition to this, 21,855 lbs. of green manure seeds were supplied to and sold from this Agricultural Station as well as 2,016 lbs. of Cambodia cotton seed.

Implements.—The sale of implements has been as follows :—

Scind ploughs	31
Harrows	24
Improved country ploughs	6

Besides this six bodies and six spare shares of the Scind plough have also been sold.

Staff.—This Agricultural Station has been understaffed throughout the period under report until an Additional Assistant Farm Manager was posted here in March. Thus the work has suffered considerably both on the Agricultural Station and in the District. In fact, it has hardly been possible to spare any officers for district work.

A new well has been sunk this year in place of the one which fell in and the old well has been filled in.

The revenue of the farm has shown a considerable increase and amounted to Rs. 4,208 against an expenditure of Rs. 4,284. This revenue includes the value of seeds, etc., supplied free which amounts to Rs. 126-5-4.

One pair of bullocks have been purchased to replace an old pair which were sold.

Receipts.			Charges.			Amount.		
Rs.	A.	P.				Rs.	A.	P.
			Experimental Farm and Cultivation—					
Sale of farm produce. 3,829	12	7	A. Capital Charges—					
			1. Moveable—					
			(*a*) Purchase of livestock	...		152	12	3
			(*b*) Purchases of deadstock	...		139	10	8
			2. Immoveable—					
			New Works	..		231	8	10
			B. Working Expenses—					
			1. Repair and upkeep of all kinds	...		419	8	7
			2. Maintenance of cattle ...	...		849	10	4
			3. Cultivation expenses—					
			(*a*) Cooly labour	...		1,516	12	9
			(*b*) Hire of cattle and drivers	...		1	14	0
			(*c*) Miscellaneous cultivation expenses.	ex-		546	9	7
			4. Seeds and plants	...		101	7	2
			5. Manures and chemicals ...	...		264	3	0
			6. Sundries	...		60	6	5
3,829	12	7		Total	...	4,284	7	7

The Taliparamba Agricultural Station.

Season.—The season has been particularly favourable. For paddy, it is generally stated, that the season has been the best for many years past. Pepper has not borne well, but this cannot be put down to the season. Last year's crop was a heavy one and the crop which follows such is always small in spite of the season.

The hot weather rains were light and as a consequence there was a delay in planting and sowing the dry land areas. Many of these crops therefore suffered when the monsoon burst. The monsoon continued until right up to the end of September and was followed in October-November with good north-east monsoon rains. Thus in spite of the damage done at the sowing season, the dry land crops did better than was expected. These late rains, however, delayed the pepper harvest and caused the "Pollu" disease to be worse than usual. More than 4½ per cent. of the harvested crop this year was destroyed by this pest and this does not include that which was shed in the gardens.

The Agricultural Station, for purposes of report, can be divided into three areas (1)—Wet lands where paddy and sugarcane are grown; (2) pepper gardens which is mainly confined to pepper though a few subsidiary crops are included in this area such as plantains, jack fruit, arecanuts, coccoanuts; (3) dry land crops which include dry cereals grown in rotation with root and other money producing crops.

Wet lands Sugarcane.—The farm crop has as usual been grown both for demonstration purposes and to supply, in part at any rate, the demand for sets. The red Mauritius and B. 208 varieties continue to be the best, though several other varieties are under trial.

No experiments were carried out with paddy which was grown merely as a demonstration of the methods of paddy cultivation found to give the best results on the Agricultural Station. Two varieties were grown, viz., Thavalakannan and Kayama which yielded at the rate of 2,720 and 2,729 lbs. of dried and cleaned grain per acre respectively; *i.e.*, nearly 1,100 Madras measures per acre. The whole of last year's crop was sold for seed purposes and reports from those who have sown it testify to its superiority. It is expected similarly to again dispose of the whole of this year's crop for seed.

The Pepper Gardens.—The total yield of pepper this year is low, but this was to be expected after the high yield obtained last year. Moreover Block III which should this year have given a high yield suffered much more severely from "Pollu" disease than the other blocks. The plot which has been manured with lime and leaf mould has again given an increased yield and since 1907 has shown a steady rise in yield from 5·75 Madras measures in that year to 140 Madras measures in the year under report. Leaf mould and fish manure have also given good results, while a combination of these two promises well, though it has not been tried for a sufficient time to speak definitely as to whether it will be profitable even though it gives higher

yields. Experience goes to show that the time has gone by when pepper can be grown with profit without manuring. Certainly this can be done on virgin forest land, but such land is now scarce and if pepper is to survive as a crop in North Malabar, more liberal treatment seems necessary and trials of heavier applications of manure are now being arranged for.

Dry Land Crops.—It has now been clearly demonstrated that the permanent cultivation of dry land can be very profitable on the West Coast. Trials have this year been made with different cereals and pulses and different varieties of these. Though at present there is not much prospect of these in themselves being very remunerative crops, yet their cultivation is essential in forming the rotation which includes money crops such as ginger, turmeric and chillies.

The cultivation of ginger in North Malabar is now rapidly extending from the centre of the Agricultural Station. Up till this year, the whole crop raised on the Agricultural Station has been sold as seed, but this year it seems that people have ample with which to extend the cultivation and it has been necessary to skin, dry, and prepare for the market.

Staff.—The staff has now been increased by the addition of an Assistant Farm Manager and it is now possible to pay more attention to district work both in Malabar and South Canara. Efforts are being made also in Malabar to co-operate with the district officials in starting Village Agricultural Associations and arrangements are being made to start a few in each division.

Visitors.—The Agricultural Station still continues to attract large numbers of visitors from all parts of the West Coast. It is felt, however, that now the scope of work on this Agricultural Station has developed that an Agricultural Station in some more accessible place where wet cultivation and cocoanut cultivation can be studied is desirable, but without more superior staff such extension does not seem possible.

Receipts.			Charges.	Amount.		
RS.	A.	P.		RS.	A.	P.
			Experimental Farm and Cultivation—			
Civil works. 93	8	0	A. Capital Charges—			
Sale of farm produce. 1,234	13	7	1. Moveable—			
			(*a*) Purchase of livestock ...	...		
			(*b*) Purchases of deadstock ...	8	3	0
			2. Immoveable—			
			New Works	124	7	3
			B. Working Expenses—			
			1. Repair and upkeep of all kinds ...	248	9	7
			2. Maintenance of cattle	78	6	9
			3. Cultivation expenses.—			
			(*a*) Cooly labour	515	6	2
			(*b*) Hire of cattle and drivers ...	...		
			(*c*) Miscellaneous cultivation expenses.	220	10	2
			4. Seeds and plants	68	12	9
			5. Manures and chemicals	138	14	3
			6. Sundries	193	1	6
1,328	5	7	Total ...	1,596	7	5

H. C. SAMPSON,
Deputy Director of Agriculture.

APPENDIX III.

ADMINISTRATION REPORT OF THE GOVERNMENT AGRICULTURAL CHEMIST FOR 1912-13.

I have the honour to submit herewith my annual report for the year ending 31st March 1913.

2. The Government Agricultural Chemist was absent on combined leave from 17th April to 15th October 1912, and during this period the First Assistant M.R.Ry. M. R. Ramaswami Sivan, B.A., was appointed to act for him. The Second Assistant M.R.Ry. P. A. Subramania Aiyar, B.A., acted as First Assistant and M.R.Ry. T. Lakshmana Rao, B.A., was appointed as acting Assistant.

The services of M.R.Ry. K. Krishnamurthi Rao have been temporarily transferred to the office of the Government Sugarcane Expert for a period of five years and the vacant post has been filled by the appointment of M.R.Ry. T. Lakshmana Rao.

The appointments of Messrs. P. A. Raghunathaswami Aiyangar and B. Viswanath as Assistants were confirmed as well as K. S. Subramania Aiyar as Head clerk.

The Physics Department was placed under the control of the Government Agricultural Chemist and M.R.Ry. P. A. Subramania Aiyar was appointed to give the lectures and practical work. This Assistant is also responsible for the taking of meteorological observations.

During the year the following samples were analysed and reported upon :—

	No.
Soils	168
Manures	50
Foodstuffs and fodders	38
Oil-seeds	75
Sugarcane and sugarcane products	108
Water	38
Dairy products	880
Miscellaneous	2
Total	1,359

This is an increase of 29 samples over those done last year and is chiefly due to the fact that the recent increase of staff has permitted dairy analyses to be carried out in a systematic manner. There has, however, been an increase of 83 in the number of soils analysed, 9 in manures, 9 in fodders and 29 in oil-seeds. On the other hand, there has been a decrease of 71 in the number of sugarcanes analysed and of 20 classed under miscellaneous. The number of extra-departmental samples analysed was 118, an increase of 15 over last year.

The investigations connected with the conditions of paddy cultivation were very successful. The mode of aeration of the roots, the effect of drainage on the cropping, and the failure of green manuring under certain conditions were mainly studied. The results are now being prepared for publication as a Departmental Memoir and should be issued very shortly. These studies will however be continued mainly in reference to the effect of drainage, the manuring of the crop and with bacteriological studies of the soil conditions.

Two-thirds of the irrigated area of the Tanjore delta has been surveyed and mapped out and the remaining third will shortly be completed. If time permits, a similar survey of the irrigated portion of Guntūr will be undertaken.

With regard to the dairy, the main investigation was on the effect of the period of lactation on the composition of the milk of South Indian cows and buffaloes. This together with the routine analyses occupied the major portion of the time of one Assistant.

Systematic determinations of the composition of South Indian foodstuffs and fodders have been carried out and these will be continued during the ensuing year.

A memoir on the relationship of the black-cotton soils of India was published during the year.

During the year under review the Government Agricultural Chemist and the Acting Government Agricultural Chemist were on tour for 38 days and other members of the staff for a total of 124 days.

COIMBATORE,
17th April 1913.

W. H. HARRISON,
Government Agricultural Chemist.

APPENDIX IV.

ANNUAL REPORT OF THE GOVERNMENT BOTANIST, 1912-13.

I have the honour to submit the annual report on the work done in this section during the official year ending with 31st March 1913.

2. *Staff, leave, etc.*—Dr. Barber remained as Government Botanist until October 27th, 1912. During the year he was also in charge of the Principal's office for a month. He was appointed Government Sugarcane Expert and he handed over charge of the office of the Government Botanist to M.R.Ry. K. Rangachariar who continued to act as Government Botanist to the end of the official year. In consequence of the arrival of the Government Entomologist, the Entomological section was transferred from this section on the 24th April 1912.

3. Several changes had to be made in the staff due to the formation of the office of the Government Sugarcane Expert. The Economic Assistant, M.R.Ry. T. S. Venkataraman, the Store-keeper, James and the Plant-collector, Thomas were taken over by the Government Sugarcane Expert but they all have a lien on their permanent places for five years, with the exception of James. The Systematic Assistant, M.R.Ry. C. Tadulingam acted as Chief Assistant and M.R.Ry. G. N. Rangaswami Aiyangar has been appointed as Assistant in Economic Botany, in the place of M.R.Ry. T. S. Venkataraman.

4. Murugesam, Plant-collector, was appointed Curator and so he was transferred to the Principal's office. Under the orders of the Government (G.O. No. 1328, Revenue, dated 3rd May 1912, and Mis. No. 2732, dated 10th September 1912), the tents were transferred to the Principal along with the lascar who used to look after the tents.

5. The appointment of a Store-keeper was sanctioned by Government. An additional staff consisting of an Assistant, a Fieldman and a Plant-collector for two years was sanctioned by Government to hasten the work in the Herbarium so as to facilitate the writing of a Flora of the Madras Presidency by Mr. Gamble, but their appointments are pending. Two temporary mounters for six months were also appointed to work in the Herbarium, after obtaining the sanction of Government.

6. During the year M.R.Ry. K. Rangachariar was on leave for three weeks, M.R.Ry. C. Tadulingam for one month and the Artist for two months. The Fieldman T. S. Azizuddin who was on privilege leave and the Fieldman K. Chinnaswami Pillai who was under suspension returned to duty.

7. The only tour undertaken by the Government Botanist during the year was to Pennagaram for studying the locality, from the 25th September to 1st October 1912. The Systematic Assistant, Mr. C. Tadulingam toured in the west coast to collect specimens for the herbarium. The Economic Assistant M.R.Ry. T. S. Venkataraman along with a Plant-collector, took several trips to collect sugarcane sets and arrows from various places, Tanjore, Karur, Udumalpet, Dharapuram, Sulur, Samakulam, etc., with a view to plant them in the newly-started sugarcane breeding-station.

8. The laboratories are all now well equipped and in the course of a few years it is hoped that they will become well-fitted model laboratories. The new cases for the Herbarium were received but they are not very well made.

9. As usual two courses in Botany were given to the students of the College, one in Elementary Botany and the other in Agricultural Botany. The course in Elementary Botany consisted of 58 lectures and 60 practical classes. The subject was dealt with from a physiological standpoint as the physiology of plants must be made the foundation of agriculture. There were 60 lectures and 62 practical classes in Agricultural Botany. The subjects dealt with were Plant Ecology of an elementary character, gardening, detailed study of the more important crops, the general principles of breeding, Mendelism and seed analysis and testing.

10. *Economic Botany*.—The economic work of importance done during the year is the study of sugarcane. Canes were obtained from Bengal, United Provinces, Samalkot, Bangalore, Tanjore, Singanallur, Udumalpet, Koilpatti, Dharapuram and from West Indies and Java. All these sets were planted in the Botanic garden. The Bengal canes were very carefully studied as regards their general habit, disposition of leaves and buds. The germinating sets were also carefully studied and special attention was paid to the leaves to see if there are differences in arrangement etc.

11. During the year forty-eight cane seedlings became well established and these were planted and were carefully looked after. About 30 seedlings were obtained from the arrows of Chini and there were different types of seedlings. For purposes of comparison and study, seedlings of S. *spontaneum* were also raised from arrows. The bursting of the anthers in sugarcane arrows of several varieties were observed and Puvan was found to have healthy anthers, and J-36 had no healthy anthers. Some preliminary attempts were made to graft sugarcane sets and it proved a success.

12. Good deal of work was done in connection with the opening of the sugarcane-breeding station. Six acres of land were taken on lease for one year and this was prepared by manuring and digging trenches. Samples of soil were sent to the Agricultural Chemist for analysis. Plans of the lands at Chettypalayam were prepared with a view to acquire the same.

13. Redgram harvests were examined and tested as to cooking qualities and taste. Seeds were selected but the plants raised from the seeds did not grow well. Some of these, however, were selfed, and the selfed seeds are preserved for further trial. As a preliminary step to study the variations in the redgram plant, the redgram crop in the field No. 10 was examined. The variations in the seeds and pods were very great. But the flower and the general habit of the plant showed much less variation. Two types of plant seem to exist, judging from the habit of branching—plant with erect branches and plant with branches slanting.

14. Cotton Kappas from different parts of the district were identified for the Collector of this district.

15. The study of the weeds of the farm was taken up and all the weeds growing during the earlier part of the year have been collected and named. The work will be continued throughout the year. It is proposed to maintain a regular record of the weeds growing in the fields individually from year to year for some time, with a view to see if there is any correlation between the kind of weeds and the crop growing in the field. Seeds of the more troublesome weeds will be tested for vitality.

16. Over a hundred samples of seeds were tested for germination capacity. Seeds of selected crops, stored and mixed with ashes and naphthalene were tested at intervals of six months. As the results are very satisfactory and interesting I give full details of the test:—

The grains were tested and stored on the 15th September 1911 in three different ways.—

(*a*) Kept in bottles after mixing with the grain a small quantity of naphthalene.

(*b*) Kept in cloth bags with naphthalene outside the bag.

(*c*) Kept in bags after mixing with the grain some ashes.

The germination capacity was tested thrice, March 1912, September 1912 and April 1913 and the results are as follows. In every case 100 seeds were tested and the results noted.

Paddy.—			Cholam.—		
	(*a*)	94, 86 and 52.		(*a*)	89, 90 and 83.
(95)	(*b*)	92, 89 and 23.	(99)	(*b*)	91, 90 and 97.
	(*c*)	98, 98 and 74.		(*c*)	95, 92 and 91.
Transvaal Cumbu.—			K. Cumbu.—		
	(*a*)	98, 97 and 96.		(*a*)	87, 84 and 78.
(99)	(*b*)	87, 89 and 97.	(93)	(*b*)	88, 90 and 66.
	(*c*)	96, 94 and 97.		(*c*)	93, 90 and 86.
Ragi.—			Cotton.—		
	(*a*)	99, 96 and 91.		(*a*)	72, 83 and 52.
(99)	(*b*)	98, 94 and 92.	(85)	(*b*)	94, 88 and 94.
	(*c*)	98, 96 and 93.		(*c*)	93, 88 and 73.
Lablab.—			Horsegram.—		
	(*a*)	65, 64 and 12.		(*a*)	89, 82 and 78.
(81)	(*b*)	62, 68 and 16.	(89)	(*b*)	88, 80 and 72.
	(*c*)	79, 80 and 65.		(*c*)	87, 85 and 71.
Gingelli.—			Castor.—		
	(*a*)	93, 92 and 75.		(*a*)	75, 79 and 32.
(90)	(*b*)	83, 85 and 80.	(84)	(*b*)	83, 86 and 4.
	(*c*)	96, 92 and 90.		(*c*)	93, 91 and 90.

N.B.—The figure within the brackets denote the germination capacity at the time of storage.

17. *Systematic Botany.*—New cases were received for the Herbarium and all the specimens were transferred to them. All the specimens collected by Dr. Barber except imperfect and unidentifiable sheets, have been identified and incorporated with the main collection. Besides these, 887 sheets, of specimens of plants collected by Dr. Bourne on the Pulney hills and 691 sheets of Mr. Gamble's collection were also incorporated. The Grewias sent to Kew for identification were returned. In this lot eight species are new to science; *i.e.*, Grewia Wightiana, G. Griffithiana, G. Gamblei, G. Lawsoniana, G. Wattiana, G. Barberi, G. Optiva, G. pandaica. A further lot of Grewias was again sent for identification. About 50 sheets of duplicate specimens of Grewias were sent to Mrs. Bourne.

18. During the year 1,633 sheets were named and names were written on 2,404 sheets. All the original pencil drawings of Wight and Beddome's published works received from Ootacamund, have been sorted and mounted in albums. About 150 plants were identified for various correspondents. Information in the form of short notes were supplied to correspondents, the following being the important;—

Trapabispinosa, Agaves of the Presidency, Crocus sativus, Ceropegias, Bamboos of Madras papaw, cultivation of poppy, cereals and pulses suited for fowls, Hydrilla Verticellata in Ellore Canal and Cephaelis Ipecacuanha.

19. The Curator of Pudukota Museum was given some training in Herbarium work during the month of September.

20. The Botanic Garden is now well established and looks very pretty due to improvements made for facilitating irrigation. During the year 1,325 plants were distributed and 348 were received. The garden is largely utilised as an adjunct to the Botanic laboratory for demonstration purposes. All the horticultural operations, such as, grafting, layering etc., are carried out by the students in the garden. Several small improvements such as laying out paths and establishing hedges of sort were effected.

21. The fruit garden is not in a satisfactory condition. The guava trees were attacked by scale insects and then came in an attack of fungus. However these were put down by spraying the plants. The fig plants are suffering badly being attacked by a rust. The grafted mango plants bore a number of fruits this year. Vines and Citrus are doing but poorly. Papaw trees are doing well and they bear fruits in abundance. Unless special arrangements are made for an abundant supply of water the fruit garden cannot be well established. The peach tree in the garden flowered freely and yielded some fruits.

COIMBATORE,
29*th May* 1913.

K. RANGA CHARI,
Ag. Government Botanist.

APPENDIX V.

ADMINISTRATIVE REPORT OF THE GOVERNMENT ENTOMOLOGIST, 24TH APRIL 1912 TO 31ST MARCH 1913.

The present is the first annual report from the Entomological Section as such. In previous years this had been represented by three Entomological Assistants working under the supervision of the Government Botanist and it was not until 24th April 1912, when I joined duty as Government Entomologist, that the Entomological Section was constituted as a separate section of the institute. In starting a new section close attention had necessarily to be paid to the essential preliminaries, *e.g.*, the selection and training of a new staff, the selection and obtaining of apparatus and stores, the designing of laboratory fittings and buildings, and the preparation of exactly correlated schemes of future work —, all take up a great deal of time whilst making very little show and require to be reckoned in any assessment of a first year's work.

The present report does not attempt to deal in complete detail with all the many-sided activities of entomological work, but most of the subjects dealt with during the year are indicated and more complete details of each will, it is hoped, be given in future separate publications.

2. *Staff.*—The following staff of the Entomological Section was allowed in the first instance, viz.—

Three Assistants (previously appointed).
Three fieldmen.
One "draftsman."
Two setters.
Two clerks.
One laboratory attendant.
Four peons.

3. M.R.Ry. K. S. Padmanabha Aiyar, Third Assistant, resigned his post on 16th July 1912 and his place was filled by M.R.Ry. C. Narayana Aiyar, Farm Manager, second grade, who joined duty on six months' probation from 1st November 1912.

4. The rate of pay (Rs. 15—2—25) offered to the "draftsman" proving insufficient, no suitable man could be obtained, but proposals for an increased staff of artists on better pay have lately been sanctioned. The want of artistic assistance in the preparation of drawings was severely felt during the year.

5. It may be noted here that there seems to be little difficulty in filling posts for which merely educational qualifications are requisite, but this is not so in the case of appointments such as those of assistants and fieldmen. For these merely educational qualifications are neither sufficient nor really important; a personal aptitude for biological work is, in my opinion, a far greater necessity and it is precisely this qualification which is at present lacking in practically all Indian candidates. These rare exceptions, when found and proved satisfactory, should be given every encouragement in the way of position and pay in order to attract these men and obtain the best results.

6. *Accommodation.*—The entomological laboratories, which were intended for a museum and preparation room in the original design of the building, are situated in the west corner of the south block of the Agricultural College at Coimbatore and comprise two rooms. No structural alterations were required to these, but extra fittings (work-benches, etc.,) were necessary to equip them for work; detailed plans and estimates for these fittings were prepared and sanctioned during the year, but work had not been started by the end of the year.

7. A store-room and office were provided from existing accommodation in the college and were completed and occupied by the end of the year.

8. An insectary, which is absolutely necessary for the rearing of insects, was proposed by me when I visited Coimbatore in January 1912 and detailed plans were then made and submitted. Sanction was accorded for the construction of this building which was finally commenced in January 1913 but not completed by the end of the year. The completion of the insectary is at present the most urgent necessity of the Entomological Section, which cannot be considered to be in complete working order until this building is ready for occupation.

9. *Tours.*—The Government Entomologist spent 76 days on tour in Bellary, Coorg, Mysore, Shevaroys, the Nilgiris and Madras.

The First Assistant spent 39 days on tour in Gōdāvari, Kistna and Kurnool.

The Second Assistant spent 139 days on tour in Bellary, Kurnool, Malabar and South Canara.

The Third Assistant spent 66 days on tour in Bellary, Kurnool, Tanjore and the Nilgiris.

The two fieldmen spent 108 days on tour in Salem, Madura, Rāmnād, South Arcot and Bellary.

10. These tours were concerned with Deccan grasshopper, coffee-fertilization, cheroot beetle, fly pest of toddy and various investigations of insects reported as pests from the several districts.

11. *Insect pests.*—The following are a few of the principal insect pests on which work was done during the year :—

(*a*) *Deccan grasshopper* (*Colemania sphenarioides*).—This wingless grasshopper did considerable damage in the western taluks of the Bellary district in 1911 and a similar outbreak was expected in 1912. A leaflet was prepared in English, Telugu and Canarese, detailing the lifehistory of this insect and the measures to be adopted against it, and this was distributed throughout the districts concerned. In April–May an Assistant was sent to Hadagalli and Yemmiganur to collect egg-masses for investigation of the parasites of this grasshopper. In July he was again sent to the Bellary district to note where the young hoppers were hatching out and to obtain exact information of the distribution of the insect. In places where the grasshopper had done much damage in the preceding year the cultivators were gathered together and told about the lifehistory and preventive measures, and bag-nets were distributed in all affected localities for use by the cultivators in their fields and as patterns. In August I visited Bellary, Hospet, Bellahunsi, Hampasagaram, Hadagalli, Harapanahalli, Kottur, Kamalapuram, Siruguppa, Beeravalli and Adōni, whilst Yemmiganur (in Adōni taluk), whence a petition had been received regarding serious damage to crops by grasshoppers, was visited by my Second Assistant. The fields were examined and bagging methods demonstrated to the cultivators. The attack in Bellary, however, was found to be comparatively slight in the western taluks, but at Beeravalli (18 miles north-east of Siruguppa) a few hundred acres were found to be very badly infested. Experiments have been made here to determine the effect of deep-ploughing on the vitality of the egg-masses. In parts of Kurnool, into which this grasshopper has spread of recent years, the attack was serious, although information was received too late to enable preventive measures to be adopted and these will be put in force in the present year.

There seems to be little doubt but that the Deccan grasshopper is slowly spreading eastwards and southwards from the northern and western parts of Bellary. On first arrival in a new district it is little noticed as a rule, being in small numbers, but these increase very rapidly until after three or four years they may have attained such proportions as to affect the more or less complete destruction of all the dry crops, and this state of affairs may last for several years in any one district. Thereafter, so far as the evidence goes at present, it appears that its natural enemies (principally cantharid beetles) increase at the expense of the grasshopper and keep down its numbers, so that we may expect to find scattered outbreaks of this grasshopper all along the edge of its area of distribution which is extending yearly. This insect requires very careful watching for many years to come and, if an Entomologist were to devote himself to this work entirely, his time would be fully and usefully occupied.

(*b*) *Cheroot beetle* (*Lasioderma serricorne*).—This beetle is only too familiar to every smoker of cheroots in India and does damage totalling *lakhs* yearly, not only by damaging made cheroots but by destroying wholesale bales of stored tobacco, riddling the leaves so that they become useless for making the outer covers of the cheroots. At the request of a leading firm of cheroot-makers in Madras, I investigated the matter and worked out a method, applicable on a commercial scale at trifling cost, whereby the finished cheroots may be freed from the beetles before being boxed, after which they are safe from attack.

(*c*) *Cotton stem weevil* (*Pempheres affinis*).—This does very considerable damage to exotic cottons in the Coimbatore district to which at present this pest appears to be confined. The caterpillar bores into the stem just above ground-level, causing a characteristic swelling and weakening the stem so that it often snaps across during heavy wind or rain. Various experimental methods have been tried but little success has been attained, and it is essential to obtain exact knowledge of the lifehistory of the weevil before any reliable method can be recommended.

(*d*) *Fly pest of toddy.*—In November and December 1912 a blue-bottle fly was bred in immense numbers in the fish-offal along the coasts of South Canara and Malabar. These flies flew inland in almost incredible numbers and congregated on the spathes of the toddy-palms in such quantity that they sucked up all the toddy as it exuded besides covering the spathes and pots with their excrement so that even the small quantity of juice which ran into the pots at night was fouled and discoloured. The flies also infested the shops of the toddy-sellers and buzzed around the pots into which they fell and were drowned in immense numbers so that they were a great nuisance. This pest was investigated and a method devised for protecting the collecting-pots on the trees from access by the flies. A leaflet in English and Canarese on this subject has been prepared and will be issued during the current year.

(*e*) *Stenachroia elongella*, Hemps. (Pyralidae). Webbing earheads of cholam at Hagari.

(*f*) Cardamom capsules in Coorg attacked by a small Scolytid beetle which may destroy 30 per cent. of the crop. Further investigation of this is required.

(*g*) *Spodoptera mauritia*, Bdv. (Noctuidæ). Several cases of this swarming caterpillar on paddy, fodder grass, etc.

(*h*) *Nymphula depunctalis* (Pyralidæ). Several cases of this aquatic caterpillar attacking paddy, mostly in Malabar.

(*i*) *Agrotis ypsilon* (Noctuidæ). A bad case of attack of potato plants by this cutworm was reported from Yercaud. Spraying with all sorts of different insecticides, collection by hand of the caterpillars, trapping of caterpillars and moths and laying down attractive baits were

all tried but, though immense numbers were killed, the attack remained so persistently troublesome that about 80 per cent. of the crop was lost. Investigation into this pest is being continued.

(*j*) *Azygophleps scalaris* (Zeuzeridæ) attacking Bengal Daincha plants.

(*k*) *Antestia cruciata* (Pentatomidæ). A bad attack on coffee in the Nilgiris and also reported on jasmine at Salem.

(*l*) Scale insects on Babul (*Acacia arabica*) at Coimbatore a bad attack in December. Predaceous enemies were present but the scales were defended by Black ants (*Componotus compressus*.) Isolation of the affected trees by cutting away branches etc., in contact with the ground and painting a ring of tar and crude oil emulsion (half and half) around the stem kept away the ants when the natural enemies quickly checked any further increase of the scales.

(*m*) Rice bug (*Leptocorisa varicornis*) on paddy on the Coimbatore farm. It was found by experiment that small-hand-nets were far more effective than large bag-nets for control of this pest.

(*n*) *Semi-looper* (*Acha melicerta*) on castor. Sporadic outbreaks of this were checked by handpicking of the caterpillars.

(*o*) *Euplexia conducta* (Noctuidæ). Caterpillars on Safflower a bad attack. Spraying with lead chromate proved ineffective but spraying with lead arsenate quickly checked any further damage.

(*p*) *Udaspes folus* (Hesperiadæ) on turmeric at Coimbatore. About 25 per cent. of the leaves were affected by the caterpillars which were easily checked by hand picking. A large proportion was found to be parasitized.

(*q*) The ordinary cotton pests (*Earias insulana* and *Earias fabia*, *Gelechia gossypiella*, *stagmatophora coriacella*, *Dysdercus cingulatus*, *Oxycarenus sp. Lecanium nigrum*, etc.,) were all dealt with during the year, but call for no special comment.

(*r*) Mites on cholam, turning the leaves red. This pest is checked by a coccinellid beetle, which devours the eggs of the mite; no remedial measures, practicable on a field scale, have yet been devised. A similar mite attacking sugar-cane seedlings was controlled by dusting on flowers of sulphur.

(*s*) *Chilo simplex* (*pyralidae*), caterpillars boring in cholam, etc.

(*t*) *Diatræa sp.* (probably *venosata* Wlk.=striatalis, snell.) (Pyralidae). caterpillars boring in sugar-cane.

(*u*) *Aleurodes bambusae* (Aleurodidae), a severe attack on giant bamboo at Coimbatore.

(*v*) *Epacromia dorsalis* (Acrididae) attacking young ragi and daincha crops in Madura. By the time that information reached me and a member of my staff was sent to investigate, however, the attack was over.

(*w*) *Kumblihulas*—swarming on maize and cow-pea on Coimbatore in July were collected by hand and dropped into a tin of oil and water. One boy cooly, working four days, checked the whole attack.

(*x*) *Pundaluoya simplicia* (Fulgoridae), a severe but localized attack on cholam at Coimbatore in August. As the bug lives protected inside the leaf-sheaths and only suck the juice of the plants, measures such as spraying are useless. Cutting the affected plants for fodder or flooding of the field seem the only practical measures. In the present case the crop was cut and used for fodder.

(*y*) Termites (*Odontotermes sp.*) attacking young cocoanut palms at Quilandi, Malabar. The case was interesting because, so far as could be seen, the specimens doing the damage appear identical with those sent as building mounds in the adjacent areas. As a general rule, mound building Termites do not seem to attack growing crops.

(*z*) *Alciodes leopardus* (Curculionidae) attacking Gogu.

12. *Collection.*—A representative collection of insects is absolutely essential for the proper prosecution of the work of the entomologist who is constantly confronted with problems regarding the distribution and times of occurrence of insects of all kinds. On my assuming charge of the section, the collection, which was the result of six years' work, was very poor both in quality and in quantity of specimens, only about 1,500 species being represented. The size of the collection has been more than trebled during the year and the staff instructed in correct methods of preparation. This has formed no small item in the work done but was necessary to secure a correct idea of the insects occurring in Southern India.

13. *Exhibitions.*—Show-cases of insect pests of crops and silk-moths were sent to the Agricultural shows at Travancore and Ellore. Coloured figures of insect pests were also sent with the departmental show case to various Agricultural exhibitions. Ninety-four coloured lantern slides of crop pests were obtained from Pusa during the year and are now available for use at shows, etc.

14. *Correspondence.*—Correspondence and information has been exchanged with other entomological workers in India and in Europe, America, South Africa, Mauritius, Ceylon,

Formosa, Australia, etc. Thanks are due for determination of specimens to Professors Nuttall, F.R.S., and Holmgren, Hon'ble N. C. Rothschild, Mr. E. Meyrick F.R.S., Drs. Annandale and Burr, Rev. E. Wasman S.J., and Messrs. Andrews and Gravely.

15. There has also been a considerable amount of local correspondence regarding pests of various sorts (insects, rats, squirrels, etc.,) and this is likely to increase considerably as the activities of the entomological section become better known. During the current year about fifty parcels of specimens have been sent in for examination and favour of advice.

16. Cotton-bolls attacked by bollworms were sent to Bombay to Dr. Gough, Government Entomologist in Egypt, who visited India in September to try and secure parasites of these caterpillars for introduction into Egypt.

17. *Teaching.*—The second year students of the Agricultural college were given a course in Entomology, three hours weekly, of which two hours were devoted to practical field work and one hour to lecture. The final Licentiate in Agricultural Diploma examination in Entomology was held in March 1913 by Dr. Leslie C. Coleman, Director of Agriculture, Mysore. Of the nine students remaining in the class all passed, four with first class certificates, four second class, and one third class. As the examiner remarked, it was satisfactory to find that they did better in the practical examination than in paper work.

18. *Silk.*—Broods of the Eri silkworm were maintained throughout the year but the climate of Coimbatore is much too dry to suit this insect which does not seem likely to be a success anywhere in the plains of Southern India. Its experimental cultivation may be considered a failure and it is not proposed in future to rear more than a small stock to supply eggs to inquirers. During the year Eri eggs were sent to Travancore, Tanjore, Nellore, and Chingleput, and one student sent from the last named district was given some training in ericulture.

19. Under instructions from Government, steps were taken during the year for the improvement of the Mulberry Silk Industry of the Kollegal district, which I visited in July and thereafter made various recommendations regarding improvements possible in the rearing of the worms and reeling of the cocoons. Sanction having been accorded in February 1913, B. V. Raghavendra Rao was appointed as Fieldman temporarily for one year from 4th March 1913 for special duty in connection with this work, and he was sent on deputation to Pusa, Mirganj and Berhampur to acquire special training and information. He has since returned and is now at work in the Kollegal taluk.

20. A small lot of univoltine Mulberry silkworm eggs, received from Pusa for trial, were reared but proved unsuccessful.

21. *Bees.*—Under Government orders, an inquiry has been commenced into the influence of wild honey-bees on the Pollination of coffee. Unfortunately my arrival at Coimbatore was just too late to enable any direct observations to be made during 1912 as the coffee had already just flowered, but I made a preliminary tour in the coffee districts in October and November to get an idea of the local conditions and to arrange for the experiments to be made in April 1913. An account of these must await next year's report.

22. There seems to be little reason why Apiculture should not be successful in the hill and submontane districts of Southern India and it is hoped that experiments may be made on this subject.

23. *Medical and Veterinary entomology.*—I have been able to devote very little attention to these branches of work, vastly important though they are. A general study of insects and particularly of crop pests, in combination with the ordinary executive routine duties of a Government official, leave no time for work on technical subjects such as these. The following observations under these headings may, however, be noted here :—

(*a*) Specimens of ticks taken off sheep at the Coimbatore farm have been identified by Professor Nuttall, F.R.S., as *Hæmaphysalis bispinosa* and *Rhipicephalus hæmaphysaloides.*

(*b*) Specimens of fleas taken from a pony at Maddur, Mysore, have been identified by the Hon'ble N. C. Rothschild as *ctenocephalus canis.*

(*c*) Whilst investigating termite-mounds at Coimbatore in May 1912, I discovered that the open galleries formed a retreat during the daytime for a species of *Phlebotomus* which Dr. Annandale has kindly identified as *Phlebotomus minutus.* Many of these sandflies had recently fed on (probably human) blood in cases where the termitaria were situated close to occupied houses and, as this species of sandfly has been incriminated as a fever carrier, this observation regarding its habits may prove to be useful.

24. *Importation of pests from abroad.*—Two cases of importation of living insect-pests with sugarcane sent from Antigua and from Java were met with during the year and were reported at the time in my letter No. 139, dated 15th July 1912. It is greatly to be desired that early steps may be taken to protect our crops from the attentions of undesirable aliens of this description.

25. *Publications.*—The following publications were issued during the year :—

(1) Deccan grasshopper (leaflet in English, Telugu and Kanarese).
(2) Insect-pests (leaflet in English and Tamil).
(3) Hairy caterpillar—*Kumblihula,* grasshoppers, rice-bug and insect-pests. (Agricultural calendar, 1913–14.)

(4) Termites. (Agricultural Journal of India, July 1912.)

(5) Caterpillar pest of Mokameh Tal. (Agricultural Journal of India, October 1912 in collaboration with E. J. Woodhouse.)

(6) Notes and reviews in Agricultural Journal of India.

26. The following more technical notes were sent to the Bombay Natural History Society for publication in the Society's journal :—

(7) Note on a new ant-mimicking beetle.

(8) Lifehistory of a Phasmid.

(9) Lifehistory of *Coptosoma cribraria.*

27. The issue of leaflets has been severely limited by want of artistic assistance for provision of illustrations, which are essential for popular literature.

28. Towards the end of the year, the collection and records were overhauled and information collected concerning some 350 insects for the issue of a book on the principal insect-pests of Southern India. It is hoped that this may be brought out during the current year.

29. *Future work.*—A programme of work for the current year has already been submitted, but, as this is the last report which I shall forward as Government Entomologist, I may perhaps be permitted to add a few remarks on the future development of entomological work in Madras.

30. The work of the Government Entomologist may be considered under three heads :—

(1) Routine work, *e.g.*, control of staff, collections, correspondence, teaching, lecturing, preparation of journal articles, leaflets, etc., testing of insecticides, touring by himself and his staff, organization of campaigns against crop-pests, keeping himself abreast with current literature on insects and their control all over the world, and (in the future) inspection of plant imports.

(2) Research work, *i.e.*, the addition to previous knowledge of new facts regarding the lifehistory, control, etc., of insects.

(3) Medical and veterinary work, *e.g.*, the study of the numerous insects (biting flies of all sorts, mosquitoes, bugs, fleas, lice, mites, ticks, etc.) which carry diseases to man and domestic animals.

31. It may be laid down as an axiom that no man, no matter how hard-working and able, can give adequate attention at one time to more than one of these branches and, so long as there is only one Entomologist, his time must be taken up with routine work, and any adequate research on pathological work must remain practically untouched until other workers can devote themselves to these subjects.

32. Very hazy ideas exist on the subject of research and it is often imagined that a man whose time is mostly occupied with routine work can devote any odd half-hour to research. Nothing can be more absurd. Research, for any useful results to be attained, must absorb the whole of the researchers' time and energy. Nor must it be imagined that research can be carried out by anyone, for it is certain that only a very limited number of workers are fitted to carry out research.

33. That research pays needs no argument here. It may, however, be useful to indicate a very few examples of directions in which research is needed :—

(*a*) The Deccan grasshopper, mentioned above, is at present spreading slowly but gradually eastwards and southwards in Bellary and Kurnool and may prove a very serious pest as its area of distribution becomes extended. Three or four years' careful observation of its bionomics is required to give us fuller information regarding the checking of its spread and damage.

(*b*) Ten to eleven million acres annually are under paddy in Madras alone and it may safely be estimated that 10 per cent. of the paddy crop over this whole area is destroyed by *Schœnobius, bipunctifer* a small moth whose caterpillar bores in the stem of the rice-plant, so that the damage done by this one pest is approximately Rs. 10,00,00,000 yearly. A saving of even a small fraction of this loss would well repay the cost of many years' of research work.

(*c*) In some districts of Southern India coffee has been practically wiped out by green bug (*Lecanium viride*) whilst other districts, in which this insect occurs, seem to suffer little damage. Research on the causes underlying the successful increase of this pest would well repay itself.

34. Instances might be multiplied if necessary but it is sufficient to point out that there are many directions in which entomological research is required It is unfortunate that general routine work should at present necessarily occupy the whole time of the Government Entomologist, for it is obvious that the recommendation of any general preventive measures should be based on such complete knowledge as is only obtainable by special research.

35. The desirability of having a whole-time worker in Medical and Veterinary entomology is self-evident. He should be a man with medical training, a good knowledge of proto-zoology and an innate keenness for entomology. There is no reason why he should be attached to the Agricultural Department and he would probably be more suitably placed at the King Institute,

where excellent work of this kind has already been done. The Entomologist employed on this work should be entirely a researcher, unfettered by any teaching, correspondence, or routine work of any kind.

36. To sum up, I submit that the present duties of the Government Entomologist should, in the near future, be divided into following subjects :—

(*a*) General routine work.
(*b*) Research in Agricultural entomology.
(*c*) Research in Medical and Veterinary entomology, and that each of these subjects should occupy the whole of one man's time. But it must be realized that there may be difficulty in obtaining men of the standard required and that such men cannot be picked up at a moment's notice.

T. Bainbrigge Fletcher,
Government Entomologist.

APPENDIX VI.

ADMINISTRATION REPORT OF THE GOVERNMENT MYCOLOGIST.

I have the honour to submit my Administration Report for the year ending 31st March 1913. I was in charge throughout the year. The second assistant had three weeks' and the Head clerk six weeks' privilege leave. One fieldman had leave for three months and another for two months and one week. There have been five changes in the three posts of fieldman during the year, only one of the fieldmen having held his post for the whole year. The present initial pay does not attract suitable men and in order to attract diplomates of this College an application was made to have the rate of pay increased so that it might be the same as that of assistant farm manager in which grade diplomates enter on the agricultural side. The post of artist has remained vacant during the year as no one could be induced to apply at the present rate of pay. This has been a hardship felt especially in connection with teaching the students where the lack of diagrams of indigenous fungi made it more difficult to give the students clear ideas of them. Proposals have been submitted for two artists on higher pay.

I was on tour for 98 days, the first assistant for 69 days, the second assistant for 128 days, and the three fieldmen and plant-collector for 221 days in all. Tours were made in the districts of Godavari, Kistna, Nilgiris, Coimbatore, Tinnevelly, Malabar and South Canara.

The bud-rot of palmyras caused by Pythium palmivorum, Butl. and the operations undertaken to reduce it in the Godavari and Kistna districts claimed much of my time. There are two places where extension has taken place. Disease was discovered in Jagapatinagaram in Godavari and in the three adjacent villages of Vadapalli, Vunagatla and Chikkala in Kistna from 6 to 10 miles beyond the infected area. Judging from the state of the dead and dying palmyras in two of the villages I believe the disease had been there for three years, yet we did not hear of it all that time. The people did not know that their palmyras had the disease that had done so much damage in other parts of the district. So a new leaflet illustrated by coloured plates was distributed in the villages of the taluks adjacent to the infected area and attention is being paid to inspection of these villages.

In Kistna district the special staff was withdrawn from Bunder taluk. While dead palmyras where cut in 176 villages in the latter part of 1911, they were cut in only 61 villages in the corresponding part of 1912. So in Kistna district the area under operation is distinctly decreasing. As the special staff withdraws from a place the regular revenue staff keep it under observation during their ordinary work in order to report occasional cases of disease that may reappear. The operations are now confined to two main areas. One is under double-crop paddy and the soil always contains abundant moisture. The other is an upland area where palmyras grow in forest formation. The number of deaths in the former area is less this year. In the latter area, though the number of deaths is still comparatively small because the disease has but touched the edge of the forest, yet the danger of its spreading to a very great extent is serious. To keep the disease out of this upland forest is the most urgent problem of the moment.

In Godavari district the area infected is the same as last year with the exception of one village ten miles north of the nearest previously infected village. The disease is more evenly distributed throughout the villages now but a large number of palms are dying towards the coast where the land is waterlogged. The number of dead palms cut and burned is slightly greater this year. The increase is due partly to the more close and efficient supervision as there are now fourteen instead of nine Revenue Inspectors on the special duty.

There is still a considerable amount of opposition from the ryots to having dead trees cut and especially to having diseased ones treated. If the disease is noticed before the central bud dies and if all the diseased leaf-bases are cut off then the palm recovers and after from one to two years the crown of leaves is as large as ever. Untreated they may live for three and a half years, all the while a possible source of infection to their neighbours. In Kistna district there

are 1,078 of them while in Godavari the number, though not yet definitely known, is much greater. An application has been made to Government for legislation to allow diseased palmyras to be dealt with compulsorily.

As a preventive against mahali disease (Phytophthora omnivora var Arecae colem.) of areca-nuts, spraying with Bordeaux mixture was introduced in the villages of Chalisseri, Kankodu, Odallur and Alamkod, in Ponani taluk of Malabar district. Spraying began early in May 1911 and was continued intermittently till the end of the month when the rains became so heavy and frequent that it was stopped. The bunches of just over 2,000 palms were sprayed. After the nuts began to ripen a fieldman remained in Chalisseri and kept account of the nuts harvested in two sprayed and two unsprayed plots of 200 palms each and one sprayed and one unsprayed plot of 100 palms each. In two other sets of plots a record was being kept but owing to the lack of co-operation on the part of the garden-owners their record could not be completed. The averages of the former plots were 6·4 per cent. of nuts diseased in the sprayed plots and 28·6 per cent. of nuts diseased in the unsprayed plots. The comparatively high percentage of diseased nuts in the sprayed plots may be partly due to the fact that at the time of spraying some of the bunches were in flower and a few flowered later so that nuts developed on these bunches were unprotected by Bordeaux mixture. Next season in chosen plots these bunches will be sprayed during the first break in the monsoon to see whether the disease cannot be reduced to a lower minimum. The cost of the nuts saved was considerably more than the cost of spraying so that in the circumstances spraying is an economically sound operation. Much demonstration work, however, has to be done before the garden-owners will be induced to adopt an operation so novel to them. Preparations are complete for a more extended campaign in 1913 for which ten sprayers have been purchased.

In the vicinity of Tamarasseri in Malabar district cocoanut palms are dying of a bud-rot disease. From the rotting leaf-bases of young leaves a bacterium has been isolated which is like one that has been demonstrated to be pathogenic on cocoanut palms. Cultures and inoculations are in progress to determine its position and whether it is the cause of the disease. The work is being done in conjunction with the Government Agricultural Chemist.

On Samalkota and Coimbatore Farms experiments were made with a view to inoculate paddy with smut (Ustilaginoidea oryzae (Pat.) Bref). Seed was damped and shaken up with spores of the smut taken from material gathered both during the previous and present year; opening and unopened flowers were emasculated and the stigmas dusted with spores; the same was done without emasculating the flowers; and seedlings just sprouting were inoculated with spores. But not a single plant produced smutted ears.

On Samalkota farm during the season 1910–11 there was a very large amount of red-rot (*Colletotrichum falcatum*, vent) on sugar-cane. For the present season the selection of sets for planting was made clump by clump from the crop in the field. When the red rot discoloration was found in any set cut from one cane of the clump the whole clump of canes was rejected. As a result of this stringent selection exceedingly few canes were infected with the disease at the end of the growing season.

From some canes internally characterised by a pithiness and a pink colouration a species of Cephalosporium was isolated which this season reproduced the characteristic signs in inoculated canes.

After the heavy rains during the north-east monsoon there was an outbreak of fungi, the chief of which on economic plants were the "Sweet-ear disease" of cholam (*Andropogon Sorghum*), Colletotrichum on Bengalgram (*Cicer arietinum*) on chilli (*Capsicum frutescens*) on cowpea (*Vigna Catiang Edl.*) and on turmeric (*Curcum longa.*) These are being studied in the laboratory.

In the Nilgiris flax was introduced three years ago on a small scale and the crops from the original contingent of seed have been free from disease. Last year from a new parcel of seed the crop was badly attacked by rust [Melampsora lini (D.C.) Pers.] and was burned *in situ* in order to protect the other healthy crop from contamination.

The course in plant diseases to the students was extended to three months and was given in the last term of the second year. On three mornings a week three hours were devoted to the study. The course which was mainly practical comprised the life-histories of a saprophyte and a parasite, the general characters of parasitic fungi, the principal diseases of the more important crops of the Presidency and methods of prevention. The students are now in a position to observe a fungus disease on a crop, to choose suitable material and send it properly preserved to the laboratory for detailed examination and to apply intelligently any preventive remedy suggested. An examination was held at the end of the term and of the nine students who presented themselves two were placed in the first class, two in the second and five in the third. Dr. Butler, Imperial Mycologist, was the external examiner.

Twenty-five bundles of specimens of diseased plants were received from outside for identification and advice. Two hundred and forty specimens of fungi were gathered during the year.

W. McRae,
Government Mycologist.

APPENDIX VII.

ADMINISTRATION REPORT OF THE GOVERNMENT SUGARCANE EXPERT FOR 1912-13.

I have the honour to submit herewith my annual report for the year 1912-13.

I took over charge of the office of the Government Sugarcane Expert on October 25th 1912, but for some time previously had, with the permission of the Director of Agriculture, devoted myself largely to sugarcane matters, growing the plants in a small plot in the Botanic garden. Pending the acquirement of the land marked out for the Sugarcane Breeding station, two long tours were made in North India, most of the cane growing centres being touched from Behar to the Panjab, and large numbers of varieties collected for growth and study at Coimbatore. In this work a specially complete set of Bengal Desi canes was obtained from Sabour where the Economic Botanist and Agricultural Chemist had for some years grown them on pure lines. These varieties were generously placed entirely at my disposal and have materially helped me in my work.

The 48 seedling canes obtained during preliminary trials early in 1912 were grown and carefully studied. Although the flowering of the cane in 1912-13 was of a very disappointing character, no pains were spared to obtain as many seedlings as possible from such arrows as could be obtained in the neighbourhood of Coimbatore. As a result of this work some 12,000 to 15,000 seedlings were produced, a good number of which died in infancy. Of these seedlings the healthiest were picked out and some 2,000 have been selected for further study, this being the arbitrary number chosen with which it may be possible to deal.

The canes collected in the Botanic garden and the seedlings grown there were carefully studied as to their morphological characters and they were chemically analysed. The results of this analysis proved that, even with good canes the juice was very poor as the ground was unsuited for sugar production. For this reason it is impossible to form an accurate opinion of the value of the first year's seedlings and all are being grown on for a second year on the Cane Breeding station. Several appear to be of promise, but the most luxuriant appear to be lacking in purity of juice.

The land at Chettipalayam was handed over at the very end of the official year and is rapidly being got into order. A laboratory has been built and the quarters for the Assistant Manager are finished. The 2,000 seedlings have been planted out near a well of good water and are doing extremely well, but the large number of varieties collected are suffering from irrigation from an alkaline well. An oil-engine and pump have been installed but are giving some difficulty and, unless this is soon overcome, the varietal plots are in danger and many of the more delicate kinds will probably die out.

The office is in fair working order with the exception of the fact that it has been found impossible to entertain a suitable clerk on the pay offered. This clerical work is being performed largely by the scientific assistant with the help of the clerks in the Government Botanist's office and, as a consequence, the purely scientific work has suffered and is suffering a good deal. I have pleasure in recording the willing work of the staff as a whole.

C. A. BARBER,
Government Sugarcane Expert.

7th June 1913.

APPENDIX VIII.

(i)

ANNUAL REPORT OF PISCICULTURAL EXPERT TO THE GOVERNMENT OF MADRAS, 1912-1913.

I have the honour to submit the annual report on piscicultural operations for the period ending 31st March 1913.

2. I was in charge of the piscicultural operations throughout the year as Piscicultural Expert to the Government of Madras, and was occupied during this period on tours of inspection and investigation.

3. I visited the Sunkesula fish farm in April, June, July, September, November, December, January, February, and March, the trout streams of the Nilgiris and Avalanche during the latter half of April, May and in September, the Hilsa hatchery at the Lower Anicut in July and August; the Nellore district was investigated in August, October, December and January; an inspection of the Colair lake was made in December while the Markapur tank was examined in January, and the Kristna gorge in March last.

The work at Sunkesula continues to progress but the class of work being new to the men employed I find it necessary to pay constant visits to see it is properly carried out.

M.R.Ry. C. G. Chakrapani Aiyangar, B.A. (Sub-Assistant, Madras Fisheries), was placed under my immediate control in July last. His duties are to look after my office work, correspondence, account work, etc., and to accompany me on my tours of inspection and assist me during investigation. During the year under report he was placed on special duty to carry on the stocking of the Kurnool-Cuddapah canal which he carried out in a satisfactory way. I am pleased to say he takes a keen interest in the pisciultural work and will prove of great assistance as this work progresses.

S. A. D'Silva, Fishery clerk, who is attached to me on the Sunkesula fish-farm work, has shown great promise. I hope to utilise his services on one of the proposed new fisheries either at Colair or Allur and get him to instruct another maistry or clerk to take his place at Sunkesula.

4. *Sunkesula fish-farm—Staff.*—A revised establishment for the farm was sanctioned in G.O. Mis. No. 3215, Revenue, dated 29th October 1912. V. Durvasulu Pillai, Retired Subadar Major, was temporarily appointed as Superintendent in August last on Rs. 50 per mensem. He is getting to understand the work and it is hoped he will prove a success.

Ponds.—A new pond was constructed during the year at a cost of Rs. 170 to afford room for a large head of small fish.

New appliances.—For transporting fish easily without injury or loss during stocking operations, I designed and constructed special live cars for use on all sections of the Kurnool-Cuddapah canal. These cars are constructed locally and are found to answer their purpose admirably.

A special box for carriage of murrel was also designed and used with a certain amount of success. It was found however that the fish are liable to damage themselves, although surrounded by moss and kept in separate partitions. A few alterations will no doubt remedy this fault.

Special hatching boxes for murrel eggs and a floating box for protection of the small fry in the early stages, were designed. These are all being remodelled to prevent the possibility of the numerous enemies passing through the fine gauze mesh during their minute stages and which I find grow sufficiently fast to do an immense amount of damage in the boxes.

As per my notes on murrel breeding recently sent to the Director of Fisheries, Punjab, I am adopting glass tanks for hatching and rearing murrel. By this means I hope to keep them under constant observation and should any enemies appear they can be at once removed.

Stock of breeders.—During the year under report a large number of breeders, catlas, labeos, murrel and a few mahseer were secured and taken to Sunkesula.

A large number of fry of the more useful varieties of carp were rescued from the Tungabhadra and portions of the canal (where they would in the usual course of events perish during the dry season), and kept at the farm. As soon as these fish have grown sufficiently large, they are turned out into the different sections of the canal and tanks.

Fish food.—The fish are fed daily at the farm; the labeos and catlas with a mixture of cholam and earth, and murrel and mahseer with frogs and small fish.

As the farm was originally designed to grow fish for stocking purposes only, the additional work of growing murrel for the market necessitates a large supply of live food in the shape of frogs being kept up, and for this purpose a frog breeding ground was established; but, notwithstanding this, at certain seasons great difficulty of getting sufficient food is experienced. The present small staff have to be sent out in search of food which interferes with the other work on the farm. I am proposing in future only to keep a small number of murrel at the farm for marketting and demonstration purposes at the live-fish market. The surplus murrel will be turned into Edurur to grow and when this dries those that remain will be transferred to the farm and kept over the dry season; after this the small ones will again be sent to Edurur and the big ones marketted.

Diseases of fish.—The fish have been remarkably free from disease, but some of the breeders that had got damaged were attacked by fungus (saprolegnia). This growth was quickly removed by two or three applications of a salt solution.

Enemies.—Birds were a source of considerable trouble carrying away a good number of fry and bigger fish. To try and get rid of them, I applied for a small rifle which Government sanctioned for the use of the Superintendent. Some other means will have to be adopted as numbers still prey upon the fish.

5. *Motor-boat.*—The motor boat sanctioned for the farm did not work during the year under report. The engine was sent to the Director of Industries but to no purpose. It is still with the head driver, Municipal Pumping Station, Kurnool, and I am sorry to say he has not succeeded in getting it to go. I may mention, however, that it is not powerful enough to tow the live cars against the stream and a boat of greater power is required to facilitate the stocking of waters over such a long distance.

6. *Stocking of the Kurnool-Cuddapah canal.*—The first 41 miles of the canal was stocked this year. It took a considerable time to stock this section as the live cars had to be taken down and brought again to the farm by the Public Works Department boats pulled by bulls and sometimes, as these were not available, great delay in stocking was caused. As mentioned previously a powerful motor-boat will get over this difficulty.

If a house-boat could also be obtained either second-hand or new and kept by this department on similar terms to the Public Works Department, it would prove exceedingly useful. There is often difficulty in getting a boat, as the only spare one is for the use of the Collector, Forest officers, and other officials visiting the district. It is interesting to note that as a result of the stocking of the first 41 miles of the canal the fish rentals have gone up this year by nearly cent. per cent.

7. *Live-fish market.*—With a view to supply the Kurnool market with live fish after the re-opening of the canal, when supplies are small (less than the demand), and for demonstration purposes, I selected a site and submitted plans for the construction of a live-fish market at Kurnool. Government have sanctioned the proposal in G.O. No. 1191, Revenue, dated 23rd April 1913, at a cost of Rs. 525. This will be constructed at an early date.

8. *Hilsa hatchery.*—During the last hilsa season, *i.e.*, July 1912, I proceeded to the Lower Anicut to work the hatchery. Everything was put in working order and although large numbers of female hilsa were examined no ripe ones were obtained. I again visited the place in August, but I regret to say with similar results, and as the supply of hilsa was becoming scarce, I had to close down the hatchery.

In America it appears that occasionally similar difficulty is experienced with the shad and in some rivers out of every 100 caught only one spawning shad is obtained. The hatchery has to be run each day in anticipation of getting ripe eggs and large numbers of fish handled daily, so that the work and time entailed is really greater than if ripe eggs were obtainable.

9. *Stocking of tanks—Daroji tank.*—During the year under report the Daroji tank was not re-stocked owing to the insufficiency of water-supply. It will however be stocked after September, when the term of the present fishery lease ends. The tank fishery has been rented for Rs. 201.

Cumbum tank.—Owing to unsatisfactory water-supply to this tank I suggested to Government the desirability of substituting Markapur tank, which possesses a much better water-supply. Government, while approving of my suggestion in G.O. No. 3219, Revenue, dated 29th October 1912, have called for a detailed report as regards water-supply, etc., of this new tank. For this purpose I examined it in January last and submitted a report to the Honorary Director—*vide* my letter No. 158, dated the 14th ultimo.

Barur tank.—Under my suggestion the fishery of this tank was not auctioned during the last two years with a view to give the introduced fish a chance of breeding. I examined the tank in March last and found it fairly full of fish. I have written to the Executive Engineer, Salem, to auction out the fishery this year. But from a communication recently received from him I understand that the fishery has not been auctioned. In my letter No. 106, dated 26th March 1913, I have submitted a proposal to take over the fishery of several irrigation tanks, which are fed by the supply channel to the Barur tank.

Penukondapuram tank.—This tank was not stocked till now, but will be stocked this year along with the Barur tank.

Salem waterworks reservoir.—The question of stocking this reservoir has long been the subject of much discussion and correspondence with the Sanitary authorities. It has, however, been settled in G.O. No. 918, Revenue, dated 29th March 1913, that the reservoir need not be stocked at the cost of provincial revenues.

10. *New schemes—Collair scheme.*—With a view to utilize this natural lake both for hilsa operations and murrel-breeding on a large scale, I examined it in March 1912 and submitted a scheme giving therein its scope, object and approximate cost. Government in reply referred me to Mr. Turing's report on the Collair in which he has stated that the lake completely runs dry during the hot weather. On my replying to this, Government have generally approved the scheme and called for detailed estimates in G.O. No. 61, Revenue, dated 6th January 1913. For this I mean examining the lake this month.

Nellore fishery.—In view to establish a fishery in the Nellore district in the place of Kanigiri, I visited the district several times in conjunction with the Executive Engineer to find out a suitable site. After much difficulty Allur has been selected as a suitable site; but here though other conditions are favourable, the permanent water-supply question presents a serious obstacle to pisciculture. With a view of getting over this difficulty I have selected sites for boring operations and at two of these water has been met with. A good supply was struck in the last boring near the fishery site at a depth of 72 feet below ground-level and the water rises in the pipes to within 3 feet of the surface (this level is 3 feet below the present water level in the tank). As the water is brackish it is possible that it passes through a saline strata and to test this pipes are being sunk to a lower depth. This will be reported after my visit in June.

Acclimatisation of tench.—A scheme is now under preparation for acclimatising tench on the plains; this will be submitted to Government in due course. It is however sufficient here to state that the object of the scheme is to bring tench from the hills and breed them at the Sunkesula fish-farm for stocking the Kurnool-Cuddapah canal and adjoining tanks with these. Complete details of working will be given in the report.

11. *Nilgiri fisheries.*—During the year I examined the trout streams of the Nilgiris and the Bahavani river, and am pleased to state that the trout in the former stream have done exceedingly well. The number of licenses taken out were 182 to the value of Rs. 1,495. Some very large fish were taken, the largest being 6 lb. The opening season was fixed for the 1st May, but, on examination of the trout, I found they were still out of condition owing to the lowness of the streams. All the streams contained a large number of young fish which shows the natural breeding season has been successful.

Avalanche hatchery.—The hatchery at Avalanche has been kept up-to-date and the American spawning race produced a large number of fry. The rivers are getting short of live-fish food and I am now taking action to have them replenished. I regret to report poaching has gone on in the upper Pykara and Krurmund streams during the breeding season and I am afraid a good number of large trout have been taken. To prevent this in future watchers will be stationed on the upper reaches throughout the breeding season.

The Bhavani is well stocked with mahseer and the fishing exceedingly good. I am proposing that Government should put a license on this fishing. (This will be sent in to you later). Fish are abundant in the lower reaches where netting is permitted. Conservancy has done a great deal for this river, which at one time was seriously denuded of fish by all manner of traps, poisons and dynamiting.

12. The conservancy of the Cauvery at Hoginakal is still being kept up during each dry season. I will take the first opportunity of examining the river below this place and report on the result.

13. *Miscellaneous.*—During the year under report I was elected as a delegate to the All India Malaria Conference. I was requested by the Surgeon-General and the Sanitary Commissioner to read a paper on "Mosquito-larvæ-destroying fish." To comply with their request, I conducted several experiments at the Sunkesula fish-farm and elsewhere to determine the relative value of several varieties of fish as mosquito larvæ destroying agents. The results of the experiments were embodied in my paper "Notes on fish larvæcides" read at the Malaria Conference held at Madras in January last.

At the request of the Sanitary Commissioner I advised the several local and municipal bodies as to the methods of stocking and transport of "Chela" and other fish larvæcides. I have also undertaken to supply the several district and taluk boards with suitable tin carriers devised specially for the transport of fish. Many municpalities have already gone in for these and here are orders on hand yet to be complied with.

With the sanction of the Honorary Director I supplied the Director of Punjab Fisheries with duplicates of all fishery appliances now in use at our farm.

I was asked to advise the Madras Corporation on the best means of dealing with mosquito larvæ in the numerous tanks in and around Madras; for this purpose I made an inspection together with the President and the medical officer. On my advice the tanks which otherwise would have had to be filled in, are being kept clear of weed and stocked with larvæcides. Up to the present time the President reports that it is working most satisfactorily, and practically no larvæ can be found where the instructions have been carried out.

MADRAS,
10*th June* 1913.

H. C. WILSON,
Piscicultural Expert.

(ii)

ANNUAL REPORT OF THE MARINE ASSISTANT, MADRAS FISHERIES.

I have the honour to submit herewith a report upon the operations conducted during the year 1912–13 in the section of the Fisheries Department under my charge—

2. During the year under review, my time and attention have been devoted principally to the following lines of work, *viz.*—

As Marine Assistant :—

(*a*) the culture of edible oysters at Pulicat.

(*b*) fish-farming in salt water lagoons,

(*c*) the planning of the projected new Marine Aquarium and Biological station for Madras,

(*d*) supervision of fish-canning and oil and guano experimental work at Calicut and Tanur during the Honorary Director's absence in England.

As Superintendent of Pearl and Chank fisheries to—

(*a*) the conduct of the Chank fishery,

(*b*) inspection of the pearl banks off the Tinnevelly coast,

(*c*) experiments in pearl inducement,

(*d*) the completion of a monograph on the chank.

3. *Edible Oyster culture.*—The preliminary operations came to a successful conclusion in July 1912, when cultivated oysters of one and three-fourths years' growth became available for market in commercial quantities. The condition early in this month was found extremely good,

the oysters being fat and creamy with gonads swollen and approaching maturity. Accordingly although it was late in the season, it was deemed advisable, with a view to gain experience in forwarding arrangements, to advertise the produce of the farm for sale. The demand proved encouraging and no difficulty was experienced in forwarding parcels of oysters in good condition to such distant stations as Bangalore, Ootacamund, Calicut and Tinnevelly. Repeated experiments have shown that these oysters stand prolonged removal from water even up to eight days if the packages be kept fairly cool and damp by occasional drenching with water.

4. Exceptionally unfavourable conditions prevailed from August to December due (*a*) to the partial drying up of the lake consequent upon the closing of the bar from 15th June to 19th November 1912, and (*b*) to subsequent heavy and prolonged floods. As a consequence mortality was heavy and when normal conditions were fully re-established in December, the condition of the survivors was extremely poor. Re-opening of the season had to be postponed till March 1913 and even then and for several months thereafter many of the oysters continued to show the effects of the trials they had undergone. In the main this has shown itself in a slowness to fatten and in the tardy development of the gonads; it is evident that not till the beginning of next season will they have recovered fully. The wonder is that they did not entirely die off.

5. After the bar closed on 15th June the water in the lake gradually became more saline and from the normal 1·026 S. G. it rose to 1·029 on 30th July and on 4th September reached the dangerous density of 1·030. By this time the level of the lake had gone down fully 2½ feet below mean sea level; water existed only in the deep channels and the water within the park dried up completely. Only by constantly moving, the oysters were any of them saved. As it was, great numbers succumbed before they could be removed. To make matters worse the floods of 1912 were exceptionally severe and prolonged and thus the remnant of oysters remaining alive found the medium wherein they lived suddenly changed on the 20th and 21st October from a highly saline one of 1·031 S.G. to one not to be distinguished from pure fresh water. This caused further death, but relief was soon given by the breaching of the bar and the early re-establishment of tidal conditions.

6. The majority of the oysters alive in August spawned wholly or in part between 6th and 12th August, the stimulus in this case being in my opinion, the combination of a high temperature of the lake water (79° F. at 1 P.M. on 5th August) with exposure to very hot air (92° F. at 1 P.M. on 5th August) for several hours owing to strong south wind in the afternoon blowing all water out of the bar and with the climax of abnormal and exhausting life conditions. On 4th August all oyster examined had greatly swollen gonads but on August 20th sales had to be suspended as the gonads had largely emptied and the majority of the oysters had become thin and unfit for market. Some few, those probably living at the greatest depth must have been able to withhold some part of their spawn, for at the end of December every particle of cultch below tide level was covered with an abundant spatfall. This emission synchronized with the full renewal of tidal conditions subsequent to 19th November; the bulk of this spatfall made attachment in the middle of December as the majority of the spat on collectors laid out on the 7th and 21st December was of similar size when examined at the end of the month and in January. This heavy fall of spat assures the renewal of the old beds, and if normal conditions continue these young oysters should be fit for market in July 1914.

7. The cutting off of Pulicat lake by closure of the sea-bar is a periodic phenomenon repeated at intervals usually of five years. Hence it is to be expected that favourable life conditions will now continue uninterruptedly for a period of several years. The experience gained last year will also enable more effective measures to be taken in future catastrophic-years.

8. A second centre of cultivation will be formed at Tuticorin during the coming season with a view to extend the supply of oysters to the towns of the extreme south and to enter the Ceylon market where Colombo and the large passenger steamers calling there should provide an extensive outlet for a product which can be guaranteed as grown in pure non-polluted waters.

9. A pamphlet has been drawn up and is now in the Press giving information as to the manner in which the oyster farm is carried on the forwarding arrangements and the proper treatment to accord the oysters after arrival at their destination, together with various notes of interest to oyster lovers.

10. *Marine fish-farming.*—Detailed proposals for the construction of an extensive fish-farm at Tuticorin were laid before Government early in 1912 and sanction was accorded in May. Owing to unexpected delay in the preparation of working plans by the department of Public Works, work on the sluices and bunds had to be postponed and the farm could not be stocked with fry in November as had been hoped. Meanwhile further acquaintance with local conditions, as showing the site to be even more promising than had been expected, caused the original scheme to be considerably enlarged; effort will be made to utilise the farm for several other purposes besides that of a fish-raising establishment. It is now intended eventually to cultivate edible oysters, window-pane oysters, and turtle in separate ponds or parks in addition to food fishes as the large acreage, fully 160 acres, is sufficient for these several undertakings, at least till ample data for larger schemes be obtained. An endeavour will also be made to carry on a limited cultivation of pearl oysters with a view to utilise this material to bring to a conclusion the experiments which have already been conducted with marked success in inducing the production of spherical " orient " pearls.

11. * * * * *

The use of divisional walls to separate the farm into a number of sections will facilitate the cultivation of various shell-fish and the sluice arrangement being such as to prevent the entry of undesirable fishes, such as the oyster-eating rays, will obviate the difficulty which has been experienced in Ceylon in protecting specimens of the window-pane oyster under observation from the attacks of fish enemies. Our "farm sections" should permit of continuous and uninterrupted observation of the habits and life history of the animals selected.

12. Government having sanctioned the erection of a building at Tuticorin to serve the combined purposes of laboratory, fishery office and store, it is proposed to locate this on the margin of the fish-farm where research directed to the collection and correlation of data bearing on the commercial culture of our food fishes and molluses will be undertaken. The site proposed is of ample extent and will afford suitable accommodation for the construction of a fish-hatchery if such be found desirable at a later date. The new building will fuction as a Marine Biological and fisheries station and will be the first of its kind in India.

13. *Madras Marine Biological station.*—With the rapid development of fishery work the need for a research station has become urgent. The investigation of local fishery requirements and possibilities and the carrying out of a number of practical lines of work have sufficed until the present, but now intricate problems have to be taken up which cannot be solved satisfactorily in the field by empirical methods. On the one hand the life histories of marine food, animals, of the organisms they feed upon, and of their enemies have to be studied in detail, and on the other, the physical and chemical properties of various substances obtained from marine animals and plants require special laboratory research. Without properly fitted up laboratories combined with the provision of ample aquarium facilities, the further development of fishery work can no longer be satisfactorily and economically prosecuted; by a fortunate chance the small marine aquarium which Madras owes to the enthusiasm and energy of Mr. Edgar Thurston, late Superintendent of the Madras Museum, has proved so extremely popular with the Indian public that Government suggested that an enlarged and improved edition be built to satisfy further this popular appreciation, and it has proved possible to combine this aim with the utilitarian and research requirements of the Fisheries Department. I was accordingly requested by Government to draw out in collaboration which the Public Works Department plans of the arrangements needful to provide an up-to-date marine aquarium and biological station and to this work I devoted much time and thought during the summer of 1912. The preliminary plans have now been approved by Government in G.O. No. 756, Revenue, dated 13th March 1913, and two lakhs of rupees have been sanctioned for its construction. Detailed working plans have been ordered and these are now well advanced. Ample laboratory accommodation will be provided and a special feature will be made of experimental fish hatchery; batteries of MacDonald, Fabre-Dumergue, Dannevig and other hatching appliances will be provided and with the aid of the Fisheries Inspection vessel, there should be no difficulty in obtaining supplies of ripe fishes for spawning purposes. In this connection the valuable pomfret (*Stromateus* spp.) and bamin or mango fish (*Polynemus* spp.) are specially indicated.

* * * * *

24. *Artificial Pearl Inducement.*—Some further experiments have been made carrying the process a stage further towards commercial success. With the facilities for more regular and sustained experiment which the possession of the new motor inspection vessel and of an extensive marine fish farm will provide it is hoped that the final experiments, which will change an interesting biological discovery into a commercial process capable of producing considerable revenue to Government, will soon be brought to a successful issue.

16*th June* 1913.

JAMES HORNELL,
Marine Assistant.

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

READ—the following papers:—

I

Proceedings of the Board of Revenue (R.S., Sur., L. Rds. & Agri.), No. 216, dated 31st July 1913.

The Hon'ble Mr. A. BUTTERWORTH.

Read—the following paper:—

Letter—from D. T. CHADWICK, Esq., M.A., I.C.S., Director of Agriculture, Madras.
To—the Secretary to the Commissioner of Revenue Settlement, Survey, Land Records and Agriculture.
Dated—the 19th July 1913.
No.—Dis. 1642.

I have the honour to submit the administration report of the Agricultural Department for the year 1912–13.

Resolution—No. 216, *dated* 31*st July* 1913.

The Board begs to submit to Government the report of the Director of Agriculture on the operations of the Department of Agriculture for the year 1912–13. The report, which was due in the Board's office on the 15th July 1913, was received only on the 29th idem.

The year was not characterised by remarkable development in any particular direction. The most notable events were the opening of one farm, the closing of another, the arrival of an Entomologist and the commencement of special work in connection with sugarcane.

2. *Staff.*—Mr. G. A. D. Stuart, I.C.S., continued to be in charge of the office of Director of Agriculture until 11th July 1912 when he was relieved by Mr. H. C. Sampson, Deputy Director of Agriculture, Southern division. The latter acted until 18th October when Mr. D. T. Chadwick, M.A., I.C.S., the present Director, took charge. Mr. Chadwick underwent a special course of training and obtained a degree in Agriculture at Cambridge in view to his appointment as Director of Agriculture. Mr. Southern who was acting for Mr. Sampson while he was employed on other duty was transferred to the Punjab under the orders of the Government of India and M.R.Ry. K. Ramasastrulu Nayudu Garu, Assistant Director, managed the southern division without an assistant to help him until Mr. Sampson reverted. Mr. Harrison, Agricultural Chemist, was on leave for six months and M.R.Ry. M. R. Ramaswami Sivan, B.A., acted for him. The Government of India having sanctioned the establishment of a sugarcane breeding station in this Presidency, Dr. Barber who was appointed to the charge of it assumed the duties of his post on 27th October and M.R.Ry. Rai Bahadur K. Rangachari Avargal, Senior Botanical Assistant, acted as Government Botanist for the rest of the year. In consequence of the departure of Mr. Lefroy, Imperial Entomologist, Mr. Bainbriggs Fletcher, the Government Entomologist, was nominated Imperial Entomologist, but he has been permitted to remain in this Presidency till his successor arrives. In their Order No. 2083, Revenue, dated 12th July 1912, Government accepted the principle that there should be two separate Botanists in this Presidency, one for economic work and the other to

teach at the College and to have charge of the Herbarium. The Director of Agriculture is incorrect in saying that the sanction of the Secretary of State to this arrangement has been obtained. The Secretary of State sanctioned the appointment of a third Deputy Director of Agriculture to take charge of the West Coast districts and Coimbatore as well as to assist the Principal of the Agricultural College, but has not yet selected any one to fill the post. M.R.Ry. K. Ramasastrulu Nayudu Garu who was on probation was confirmed as Assistant Director of Agriculture during the year on his completing the vernacular test. The Acting Government Botanist mentions that the additional staff sanctioned for the purpose of completing the herbarium has not been entertained. The reason for this is presumably that a second European Botanist has not been appointed, but the Director should consider whether the staff ought not to be entertained without further delay.

3. *Buildings.*—The attention of Government is invited to the remarks of the Director on the slowness of the work at Coimbatore and the defects in the electrical installation. The construction of a rest-house in connection with the College has been sanctioned and the question of constructing a dispensary, a post office, a police station and a school is under correspondence.

4. *Agricultural stations.*—During the year under review, there were eight agricultural stations at work including the Central farm and excluding the Bellary Agricultural station which was closed on the 30th June 1912. The Anakāpalle Agricultural station referred to in paragraph 3 of last year's review has not yet started work, but the land required therefor has been acquired and taken possession of.

Sugarcane.—The cultivation of sugarcane continues to spread on the West Coast as a result of the work at Taliparamba. From Palur station come complaints against the distribution of water by the Revenue authorities. The Director of Agriculture will doubtless make such representations on the subject as may be necessary.

Cotton.—Attention continued to be devoted to the improvement of the quality of this crop by selection. The season in the Ceded districts was generallly unfavourable. Nevertheless the sale of improved seed to ryots in Bellary and Kurnool showed a further and large increase. The area under Cambodia cotton in Tinnevelly is said to have decreased and complaints have been made of deterioration of the staple. Indifference on the part of the ryots to the careful selection of seed and the mixing of produce by the middlemen constitute a danger to the cotton trade to which the Director is fully alive and which he is doing his best to avert.

Paddy.—Experiments continue to be made to procure by selection superior strains of paddy and it is said that some success has been obtained at Palur. Mr. Chadwick will not attempt to frame an estimate of the advance which is being made by single seedling planting, but there is no doubt that the practice is spreading and that the ryots are becoming more generally acquainted with the advantages which it secures. Mr. Harrison's interesting experiments in relation to the cultivation of paddy should be noticed in this connection.

Green manuring.—The operations in connection with this important subject were not particularly successful mainly in consequence of the inferior quality of the dhaincha seed procured from Calcutta and of a contraction of the area available for the supply of Kolinji seed, but the important facts to be noticed are that private agencies are being started for the supply of seed in the Periyār and that the area treated with green manure is extending. The failure of the experiment with sunnhemp is justly alluded to by the Director as an important and instructive event

Sericulture.—The experiment in Eri silkworm breeding at Coimbatore has apparently resulted in failure, but efforts are being made to improve the mulberry silk industry in Kollegal.

Palm disease.—Some success has been attained in dealing with the bud rot of palms in the Gōdāvari and Kistna districts, the affected area in the latter district having been considerably reduced. The areca palms in some portions of South Malabar and South Canara have been affected by a disease called "Mahali." This is being successfully dealt with by Mr McRae who is also investigating the cause of a disease affecting cocoanut trees which has been reported from Malabar.

5. *Sugarcane breeding station.*—Work is proceeding on the sugarcane station established at Coimbatore under the sanction of the Government of India. The object of this experiment is to see whether new and superior varieties of cane, suitable specially for Northern India, can be developed at a place where canes set fertile pollen. Dr. Barber began his work only in the middle of the year under report.

6. *Agricultural instruction at the College of Agriculture.*—Twelve out of the fourteen students who appeared for the final examination of the College obtained the diploma. The prescribed strength of each class being 20, the number of students who went up for examination was disappointingly small. The proposal to divide the College course into a two years' course devoted mainly to agriculture and into a further and more scientific course is, under the orders of Government, to be referred to the next meeting of the Board of Agriculture which takes place in December next.

7. *Agricultural Associations and Exhibitions.*—Ongole and Tiruppur were the only cattle shows of importance. The question of the utility of such shows has been discussed by Mr. Sampson in his report on the cattle survey of this Presidency which has been submitted to Government and orders on which are awaited. Some attempt has been made in Tanjore, Ganjām and Malabar, as indicated in paragraph 43 of the report, to bring local Agricultural Associations in closer touch with the practical requirements of the people.

8. The attention of the Collectors of Bellary and Kurnool may be drawn to paragraph 11 (*a*) of the Government Entomologist's report wherein he emphasizes the need for closely watching the progress of the Deccan grasshopper.

9. *Meteorology.*—The rainfall registered at the various raingauge stations in the Presidency was tabulated as usual and the results were published by the Meteorologist, Madras, and Deputy Director of the Madras Observatory. The total number of stations in the Presidency at the end of the official year 1912–13 was 474 inclusive of 84 in the Native States and Coorg against 473 at the end of the previous year and of these 397 stations were inspected.

10. *Statistics.*—The following returns were published in connection with local enquiries under provincial direction :—

(1) Monthly season reports in three sections, rainfall, cultivation and prices of food-grains and salt ;

(2) annual crop forecast reports in respect of cotton, paddy, groundnut, indigo, sugarcane, castors and gingelly ; and

(3) two half-yearly reports of cattle mortality.

(True Extract.)

S. VENKATARAMADAS,
Secretary.

To the Secretary to Government, Revenue Department.
,, Director of Agriculture.

II

Proceedings of the Board of Revenue (R.S., Sur., L. Rds. and Agri.), Mis. No. 2981, dated 12th September 1913.

The Hon'ble Mr. A. BUTTERWORTH.

Read—the following paper :—

Letter—from D. T. CHADWICK, Esq., I.C.S., Director of Agriculture.
To—the Secretary to the Commissioner of Revenue Settlement, Survey, Land Records and Agriculture.
Dated—the 29th August 1913.
No.—Dis. 1970.

In regard to Board's Proceedings No. 216, dated 31st July 1913, a copy of which I have just received, I very much regret that the Board had such little time for

dealing with the report. Sir F. Nicholson's appendices were only received in my office on July 18th and was sent to the press on July 21st for incorporation along with the final proofs of the rest of the report.

2. With reference to the concluding portion of paragraph 2, I did not notice the point for comment in report. The additional temporary staff has been appointed.

3. In regard to paragraph 4, I had already addressed the Collector of South Arcot and am now awaiting his reply.

Resolution—Mis. No. 2981, *dated* 12*th September* 1913.

Recorded.

(True Extract.)

S. VENKATARAMADAS,
Secretary.

Copy to the Secretary to Government, Revenue Department.

Order—No. 3116, Revenue, dated 29th October 1913.

Miscellaneous.	Recorded.

2. Mr. Chadwick's report, of which the salient features have been summarised by the Board, affords an excellent epitome of the good work done by the department during the year 1912–13.

3. The directions in which the activities of the department have already resulted in material benefits to the ryots may be briefly enumerated—

(1) The spread of the cultivation of sugarcane and the introduction of improved methods of pressing the cane on the West Coast.

(2) The provision of improved strains of cotton, mainly, in Tinnevelly, but on an increasing scale in the Ceded districts.

(3) The discovery of pure and superior strains of paddy.

(4) The reduction of the seed rate for paddy sowing, *i.e.*, single seedling planting. The Director estimates the annual saving which would be effected by the universal adoption of this system in the Presidency at 4 crores of rupees.

(5) The introduction and extension of green manure crops.

On this point valuable work was done by Mr. Harrison in determining the relation between green manuring and drainage. This work received striking corroboration from the results of experiments with sunn-hemp at Manganallur.

(6) The prevention and eradication of bud rot in palmyras in Kistna and Gōdāvari; and of the same disease in cocoanut palms in Malabar; and the cure of Mahali disease in areca palms in Malabar and South Canara.

Investigation and experiments are being conducted in many other directions in which the work is not yet sufficiently advanced for the results to be demonstrated throughout the districts.

4. The increase in the correspondence of the department shows that its work has aroused much intelligent interest among the ryots; but the need for more men in the districts is great.

The Agricultural College at Coimbatore is primarily intended for the training of students who are the sons of land-owners and who intend to apply their knowledge to the improvement of their ancestral lands and there has been great difficulty in training diplomates for Government service.

To surmount this difficulty the Director of Agriculture has suggested a revision of the course of studies in the College instituting two courses, one of two years' duration for agriculturists and one of four years' duration for candidates for the diploma for Government service. The Government are awaiting the opinion of the Board of Agriculture which is to meet at Coimbatore in December on this proposal.

5. The work of the Central Agricultural Committee and District Agricultural Associations came under review during the year and in G.O. No. 360, dated 5th February 1913, suggestions for the reconstitution of the District Associations were made which it is hoped will result in the associations becoming valuable agents in spreading agricultural knowledge.

(True Extract.)

A. BUTTERWORTH,
Ag. Secretary to Government.

To the Board of Revenue (Revenue Settlement).
" Superintendent, Industrial Education.
" Officer in charge of Pumping and Boring Operations.
" Honorary Director of Fisheries.
" Educational Department.
" Local and Municipal Department.
" Public Department.
" Public Works Department, with copy of notes.
" Agricultural Adviser to the Government of India.
" Imperial Entomologist.
" Imperial Mycologist.
Copy to the Government of India, Revenue and Agriculture, } with C.I.
" " Commerce and Industry, }
Editors' Table.

REPORT

ON THE OPERATIONS OF

THE DEPARTMENT OF AGRICULTURE,

MADRAS PRESIDENCY

FOR THE OFFICIAL YEAR

1913-14.

MADRAS:
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

1914.

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REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE

FOR

1913-14.

I.—ADMINISTRATION.

A. Staff.

I was in charge of the office of the Director of Agriculture throughout the year and was in camp 169 days full—*i.e.*, exclusive of days partly spent in travel to and from Madras— visiting all centres of work except Kollegal besides conducting certain special enquiries under the orders of the Government. I also attended the Madura and Tiruppur Cattle Shows, the meetings of Agricultural Associations in Malabar, Coimbatore and Chidambaram, of the Planters' Association at Bangalore and the Cochin Exhibition at Ernakulam.

2. Mr. Wood and Mr. McRae were absent for six months on leave, Mr. Sampson and Mr. Shaw, who was lent from Pusa, taking their places temporarily. Thus for the second year in succession M.R.Ry. K. Ramasastrulu Nayudu was in sole charge of the Southern Division—an impossible task to do thoroughly. Four new gazetted officers joined the staff on probation during the year. Mr. Parnell from the Indigo Research Station, Sirseah, joined as Economic Botanist on May 13th, Mr. Thomas as a Third Deputy Director on November 7th, Mr. Mehta under the orders of the Government of India on December 13th and on January 6th Mr. Ballard from Nyassaland assumed charge as Government Entomologist from Mr. Bainbrigge Fletcher who in the previous month had been appointed Imperial Entomologist at Pusa. This post had been kept vacant at Pusa for Mr. Fletcher for nearly a year until his successor could be appointed to Madras. This was a great advantage to this department for which we are grateful for Mr. Fletcher has left his mark on the Entomological section and we all parted with him with regret. During his stay in Madras he prepared an excellent book—which will shortly be issued from the Press and to which allusion will be made later—on the Economic Entomology of South India entitled "Some South Indian Insects and other animals of economic importance." Mr. Thomas was under training at Coimbatore and in the Southern Division till the end of the year; but on Mr. Mehta's arrival a new Central Division consisting of the districts of Chingleput, North and South Arcot and Chittoor was created and as this officer had already had two years' experience in other parts of India he was placed in charge of it. On Mr. Parnell's appointment as Economic Botanist Rai Bahadur M.R.Ry. K. Rangachari Avargal was advanced to gazetted rank and placed in charge of the rest of the Botanical work.

3. In the report for last year it was stated that that year closed with seven vacancies in the district staff out of a sanctioned strength of 45 or 15 per cent. under strength. During 1913–14 six out of the twelve students who had successfully taken their diplomas joined the department, five to the District farms and one as a

fieldman in the Botanical Section. During the last week of the financial year the Government sanctioned the creation of six more district posts to meet the requirements of current work so that on the close of the financial year 1913–14 the actual strength of the subordinate district staff was 43 against a sanctioned strength of 51. Reference was made in the report of last year to the imperative need of strengthening the district staff if the department is to carry out its work adequately and before the close of the year under report proposals were submitted to the Local Government for increasing the number of divisions and for strengthening and reorganising the subordinate district staff. It will necessarily take some years before these are brought into full working effect.

B. Buildings and Laying out of Farms.

4. As was inevitable from the growth of the department increased accommodation was needed at Coimbatore. The Entomologist's bungalow, additional quarters sanctioned in G.O. No. 706 W., dated 17th May 1912, an insectary for Entomological work, a pot culture house for the Mycologist where he can grow diseased plants with little risk of infecting the farm, cisterns for storing rain water for use in the laboratories, an implement museum in which implements recommended by the department may be exhibited to visitors were all completed during the year as also the fittings in the Entomological laboratory. Nothing however was achieved for improving the water-supply nor was the small electrical installation in running order. Meanwhile fresh demands were made to meet urgent needs and administrative sanction was obtained for the following works: additional quarters for the increasing staff, a bungalow for the new Economic Botanist, a rest-house for the use of Indian gentlemen who visit the farm and college. The officers' club is being rebuilt by the members. A short telephone has been erected between the farm office and the Principal's room in the college which facilitates work considerably and has permitted of proposals being made to reduce the number of peons. The Postal authorities have converted the local Post office on the farm into a combined Post and Telegraph office and under the designation of Lawley Road P.O., Coimbatore has made it independent of the town office. This last change has improved the mail service very considerably from all parts except the Nilgiris and it is now possible to despatch an answer to a letter on the day it is received.

5. The question of a bungalow at Trichinopoly for the Deputy Director of Agriculture, Southern Division, has again been taken up. Another gin has been installed at Koilpatti. The erection of the gin at Nandyal had been done so badly that several alterations were carried out free of charge by the officers responsible for the work. Small quarters for the farm staff were sanctioned for Samalkot, Hagari, Anakapalle, Sirvel Farms and for Dr. Barber's Sugarcane Breeding Station at Coimbatore. At the first four farms work is still in progress, at the last it was completed in the year where also a small laboratory for analysing and examining canes was constructed. A good road to the Sugarcane Breeding Station was also made. The rainfall at Coimbatore was very short and the opportunity was seized to clean out some of the wells on the Central Farm. There were two rest-houses at Nandyal belonging to the Forest Department, one of which adjoins the farm and is almost entirely used by officers of the Agricultural Department. During the year this was made over to us by the Forest Department which is a convenience as the compound will afford good grazing for the cattle or for a breeding bull when one is located there.

6. Two new farms were opened during the year at Anakapalle in Vizagapatam district and one at Sirvel in Kurnool district. As a new farm had been opened in each of the two previous years these developments taxed the strength of the department very considerably and requests for farms from Ganjām and Nellore had to be refused. In fact it was only possible to appoint a manager to Sirvel towards the end of the year. Very great progress was however made at Anakapalle in filling old wells, laying out the land, fencing and constructing the necessary farm buildings. Application was made during the year for the following extensions:—

(*a*) To extend the farm at Hagari by taking in some more of the waste sand dunes—*poramboke*—by the edge of the river now entirely useless with a

view to working out the cost of enclosing them and converting them into useful pasture.

(*b*) To extend the farm at Samalkota in order to provide more space for trying selections of paddy and to reserve the present higher lying portion for work on Cambodia Cotton and the upland or dry paddies.

Both applications are pending. It is also proposed to erect a gin at Hagari in order to deal with the cotton work more economically.

II.—AGRICULTURAL EDUCATION.

7. The year opened with 41 boys at Coimbatore college and at the close there were 42 in residence for the full course and two had taken a short course. The third year only consisted of nine but all qualified for their diplomas. This is the smallest year—from point of numbers—which the college has had and is due to exceptional wastage in the first two years when one student was dismissed for cribbing in examinations, two others who were qualified teachers in the Educational Department and who had been especially taken in at the request of that department resigned after their first year leaving vacancies which it was then too late to fill. The others left either because the science course was beyond them or for family reasons. The final result however was a small class which did well in the examinations. Outside examiners were obtained in every subject and they expressed themselves to be on the whole well pleased. At least two commented on the fact that the boys would not be led astray by leading questions but stuck to their opinions with reasons. Mr. Wood is rightly always insisting on the need of self-reliance; as self-reliance, knowledge and judgment are essential qualities in those who would advocate or practise agricultural improvements. Thus outside testimony of such a nature is of value.

8. Of the twelve students who took their diplomas in 1913, six, as has already been said, have entered the department, one has joined the Mysore Agricultural Staff and, we have been assured, has started well, another is an Agricultural Instructor in Anantapur, whilst a ninth is managing for a relation a dairy close to Madura, keeping milk records of his cows and endeavouring to collect together a milking herd. The rest so far as is known have returned to their villages. Meanwhile the department is shorthanded and I have had in the year six applications from private gentlemen for the services of students trained at Coimbatore with none of which I have been able to comply although students were informed of them.

9. The number of applications for admission in each year since the Coimbatore College was opened and the number selected—limited to 20 per year—and the number who have ultimately obtained their diplomas is shown in the following table :—

Year.	Number of applications for admission.	Number admitted.	Number who have obtained their diploma or are still at the college.	
1908	82	18	14	Passed out after three years.
1909	92	14	10	
1910	146	20	12	
1911	*101	*18	9	
1912	84	20	15	Still at the College.
1913	80	20	18	

There is thus no lack of applications and for the last two years proposals to revise the course at Coimbatore have been foreshadowed. The Government directed that these proposals should be laid in detail before the Board of Agriculture, which was to meet at Coimbatore in December 1913 for their criticism. This was done and that Board thereupon passed the following resolution :—" The Board desire to express their approval of the proposed two years' preliminary course for Coimbatore College and suggest it as suitable for the consideration of other provinces." The scheme was then resubmitted to the Government and

* Excludes two posts reserved for members of the Education Service.

accepted by them and is being introduced from this June. Under it, it has been possible to admit 42 boys into the college in this year. Under the old scheme chemistry, botany and other sciences figured largely as such in the first two years' work and experience showed that many who promised to make good students agriculturally were unable to cope with these sciences. This is the general line of agricultural education in England, but in the newer countries of the world is not followed so slavishly. There an attempt is made to place agriculture—as such—in an earlier period of the course and under the new scheme at Coimbatore the first two years will be devoted to agriculture, live-stock, dairying and horticulture. All officers of all sections will take their share in the lectures at the appropriate times and places but it is on the agricultural aspect that stress will be laid in every case. It is thus hoped that this course may prove complete in itself and be found to be adequate for the intelligent management of their own land by those who return to their villages and for the training of agricultural assistants. A further course of eighteen months will be given to a portion of those—not more than 20—who succeed in the first course. This further course will be devoted to more detailed work on the sciences underlying agriculture, to the laying out of experimental plots and to farm management. The future of the department and its power of success is entirely bound up with the college and the education the students receive there. The sole object of this change in the course is to widen the scope of the usefulness of the college.

10. The hostel and joint mess owes much of its continued success to the willing work willingly and readily given to it by its cheerful warden M.R.Ry. Tadulingam Mudaliyar Avargal; cordial relations have existed throughout the year between the students and the whole of the staff and it is always a pleasure to visit the college and never more so than in term time. The Students' Union is steadily gaining strength and preserves the continuity of Saidapet and Coimbatore. The anniversary of the opening of the college is kept as an old 'boys' day and the meeting this year was well attended. The Hon'ble Sir Harold Stuart, K.C.V.O., K.C.S.I., specially came down to preside and our former Director Mr. Couchman was also present. The Students' Journal has been obtaining increased support although it does not as yet entirely pay its way. As usual the students of the third year were taken on two tours—once to the West Coast and once to the Ceded districts.

11. *Visitors.*—His Excellency the Governor of Madras inspected the farm and college on the occasion of his visit to Coimbatore in April 1913. The Hon'ble Sir John Atkinson, K.C.S.I., and the Hon'ble Sir Robert Carlyle, K.C.I.E., were present at the meeting of the Board of Agriculture in December 1913. Lord Islington and Sir Valentine Chirol also stayed at the college for a few days in January. Of the honorary visitors three visited the college during the year and their remarks were duly communicated to the Board. All visitors of whatever status are very welcome at the farm or college but they would often find their visits more profitable if they gave notice of the time and date of their coming so that arrangements could be made to show them round.

III.—BOARD OF AGRICULTURE.

12. In 1911 the Government of India directed that the Board of Agriculture composed of officers from all provinces and States of India should meet in future biennially and that the meetings should be alternately at Pusa and in the Provinces. It was also decided to augment the Board by the addition of veterinary officers from all provinces. The first meeting of the Board, as thus reconstituted, took place at Coimbatore in the first half of December 1913 under the presidency of Mr. J. MacKenna, I.C.S., Officiating Agricultural Adviser to the Government of India. Officers of the Military Farms, the Educational and Co-operative Departments were present and took part in the deliberations. Ceylon also sent a welcome delegate from their agricultural organization.

The Board was welcomed by the Hon'ble Sir John Atkinson, K.C.S.I., who, with Lady Atkinson, generously stayed throughout the full meeting and substantially contributed to the success of the meeting. In all about 82 officers and visitors

attended, most of whom were accommodated in tents. As the meeting came directly after the visit of His Excellency the Viceroy to Madras the preliminary arrangements caused some difficulty but all arrangements worked smoothly and it was a great pleasure to all officers of the department to welcome the Board to Coimbatore. Among the subjects for consideration were agricultural education, cattle and dairying, sugarcane and rice. The resolutions of this Board are dealt with by Pusa and the Government of India and are beyond the purview of this report.

IV.—RESEARCH AND EXPERIMENTS.

A.—Agriculture.

13. Only a brief summary is attempted here as details are given in the reports of the several stations and in the appendices to this report. The rainfall in the agricultural year 1913–14 was peculiar except at Samalkota and Anakapalle where, on the whole, it was good. Thus from June to the end of August, Hagari and Nandyal received only half their usual rainfall and sowings were late, in June Taliparamba was also more than half short, at Koilpatti the north-east monsoon was late in starting, whilst Coimbatore had to remain content with a fall in the year of 15·7 inches against an annual average of 25·8 inches and in the last three months in the year Manganallur and Palur received the deluge, the latter station getting 64 inches instead of an anticipated 25. These vagaries hampered the course of experimental work on the farms, and seriously impeded district work in one or two districts but generally speaking crops fared much better than might have been expected.

14. *Crops—Sugarcane—Varieties.*—From now onwards for some years the most interesting work on sugarcane from the point of view of experiment and research will be that under Dr. Barber's charge at his sugarcane breeding station near Coimbatore. The work on the district farms is of a more locally utilitarian nature, *e.g.*, the testing of varieties likely to be suitable in the neighbourhood of the farm and investigations into the systems of manuring and cultivating sugarcane. This is the last year in which experiments will be attempted with sugarcane on the wet land attached to the Central Farm, Coimbatore. This land is so uneven in quality that it is difficult to use it satisfactorily for comparative work with paddy and during the last five years has given very divergent results with sugarcane. The cultivation of this crop will only be continued there for educational purposes. Nine varieties were grown against each other at Samalkota, 14 at Palur and 7 at Taliparamba. Red Mauritius still continues to do uniformly well although at Samalkota Java 247 has again done well and Barbados 3,412 still better. The average yield per acre of all varieties was a little over 5½ tons of jaggery whilst the highest recorded figure in crop-cutting experiments on ryots' land was 4·93 tons. Of the varieties tried at Palur, Barbados 147 did best as was the case in 1911–12. The East India Distilleries Company are this year trying all these picked varieties on a large scale and I trust that they will be able to furnish the department with some interesting results.

15. *Manurial and cultivation experiments.*—These were practically confined to Coimbatore and Samalkota. The experience at Coimbatore would indicate that the addition of mineral fertilizers may be beneficial to cane although at Samalkota nothing has been found to equal the oil-cakes, *e.g.*, castor cake as manure. But at the same time the yields per acre of jaggery are less than half those of Samalkota.

Paddy

16. *Varieties.*—It is well known what an extraordinary number of varieties of paddy exist, for instance, 131 different kinds were grown on the educational plots at Coimbatore last year. Work on the district farms as far as varieties are concerned has hitherto proceeded as a general rule on two main lines (*a*) the introduction and trial of varieties from other centres; (*b*) the improvement of the local strain by seed selection—

(*a*) The testing of varieties from other centres has been mostly carried out at Samalkota, Coimbatore and Palur. At Samalkota the search has primarily been

directed to find a variety which could be grown as a second crop immediately following on the first as is customary in most districts where two crops are grown. In Gōdāvari a month or more during all which time water is available, is allowed to elapse between the harvest of the first crop and the sowing of the second. It was to utilize this period that these trials were started in 1908–09 and have been continued ever since. So far nothing has been found to satisfy these conditions. Fifteen varieties were tried last year but only three grew at all and only one gave even a moderate outturn. Varieties of paddy when transported to other districts frequently lose their special characteristics and it requires trial to determine whether any special variety is likely to prove an acquisition to a district. So far Tanjore Sirumani and Tinnevelly Poombalai promise to be useful both at Coimbatore and South Arcot.

(*b*) At nearly every one of the farms selection and propagation of single selected strains are in progress and at Coimbatore the bulk crop is from a single plant selection. At Samalkota single plant selections have also been made, but as cross fertilization does occur to a limited extent the separation of *pure* distinct strains will be a matter of time. But the most promising strain so far separated is the one referred to in last year's report at Palur. It has this year given an acre yield of 2,528 lbs. against the ordinary garudan samba yield this year of 2,218. If it maintains this superiority again efforts will be made to spread it in the neighbouring villages.

17. *Seed-rate.*—The reduction of the seed-rate for transplantation of paddy has been so consistently and regularly advocated that there is no need to refer to it at any length here. The whole of the wet land area at Coimbatore over 40 acres was transplanted from 2·11 acres of seed-bed on which 730 lbs. of seed had been sown. This works out practically to 16 lbs. of seed for each acre transplanted, whereas if the ordinary local practice were followed 106 lbs. would have been used, and the returns from the land have not decreased.

The average yield over the whole 40 acres of wet land area of the central farm was 2,572 lbs. of grain as compared with 3,762 lbs., the highest revealed on ryots' land in the crop cutting experiments, at Samalkota the average over a similar area was 3,037 lbs. as compared with 2,390 lbs., the highest figure recorded for ryots' land in the Gōdāvari this year.

18. *Manures.*—(*a*) Considerable attention is being paid at Samalkota, Coimbatore and Manganallur and to a less degree at Palur to the questions connected with the manuring of paddy. It may almost be accepted now that the most suitable form in which to apply nitrogen to paddy is in organic combination whether as green manure or as cake. It is in one of these forms that nitrogen is now always applied on the farms to this crop. It is unfortunate that the wet lands at Coimbatore are so unsuited for experimental work as it requires much repetition there before results can be accepted with any certainty. But the results of five years' continuous work at Coimbatore, nine years at Samalkota and one year at Manganallur are all in substantial agreement. At Samalkota an average increased yield of 810 lbs. of grain per acre per year over nine years has been obtained by applications of castor-cake *plus* superphosphate, at Manganallur an average acre increase of 630 lbs. of grain has been obtained by an application of green leaf *plus* superphosphate, at Coimbatore a complete manuring with an extra dose of superphosphate has given an increased average yield per acre of 660 lbs. per year over five years. The results are also in accord with chemical analyses of the soil. In all these cases also the increases in the yield of straw has been greater proportionately than the increase in the yield of grain. A careless observer using these manures might think that all the manure was going into the straw; yet these figures show that the increase of grain is decidedly appreciable. It would not be reasonable to push these figures too far as many questions connected therewith, *e.g.*, on the financial side, on the form in which to supply phosphate, though so far all indications point to the use of superphosphate, require to be worked out. If the prices of paddy continue to rise a little more the extended use of such fertilizers should become a matter of regular business for such land and crops.

(*b*) *Green manuring.*—Considerable interest will, for some years, circle round the action of green manuring, since there are many problems connected

therewith not as yet understood. Of all the essential elements which a farmer in the west buys for manurial purposes it is nitrogen which is the most expensive, but generally speaking paddy cultivated under swamp conditions utilises nitrogen presented to it in organic combination much more thoroughly than when in combination with minerals. This is most fortunate for the tropical farmer, for green leaf and green manuring are much cheaper than nitrates, etc., in fact there is no comparison, but it is also obviously more difficult to grow and manage a green manure crop than it is to distribute over a field a certain number of pounds of nitrate. Thus it was reported last year, that on the heavy delta soils at Mangamallur the application of a green manure crop in the ordinary way on these fine soils had temporarily interfered with the drainage and the paddy crops had failed. Mr. Sampson had surmised that in this year the fields would probably show the benefit of the green manure crop they had received; consequently no further manure was given to them. The figures are so striking as to merit repetition in full.

Paddy yield per acre in pounds.

Field Number.	1911–12. Treated in the ordinary method prevailing in Tanjore.	1912–13. Green manure applied, crop failed.	1913–14. No further manure added.
1	1,149	205	2,251
2	1,066	164	2,332
3	1,206	253	1,963

Other experiments were laid down to try other methods of managing the green manure but whilst none of the paddy crop failed yet the results are too inconclusive at present to draw any inferences. The general effect of seed selection, and green manuring in maintaining the fertility of rice land is indicated from the figures of Palur which station was opened in 1906–07. The average yields of paddy per acre over the whole farm in 1907–08 and in 1909-10 and in each succeeding subsequent year have been 1,777 lbs., 1,751 lbs., 2,791 lbs., 2,838 lbs., 2,934 lbs., 2,639 lbs. and in the latter years as it has all been transplanted with single seedlings another 70 lb. per annum per acre have been saved in seed. The last year was not a favourable one on account of the floods.

Cotton.

19. *Selection.*—The work on the farms is proceeding on the lines described in last year's report. Much of the improvement that has hitherto been effected in Tinnevelly has been by the distribution of seed of pure karunganni selected in bulk; the more tedious work of endeavouring to fix superior single plant strains being carried on at the same time. Last year one of these strains was grown in the villages on a sufficiently large scale to have a spinning test made. Messrs. Harvey & Co. very kindly carried this out and their report is printed in full on page 35 of the Appendix. From this it is seen that the yarn spun from the produce of the seed grown from bulk selection was between ordinary Tinnevellies and Cambodia in point of strength but superior to both in evenness, blow room loss and colour. The yarn from the single selected strain was however stronger than the above and still more uniform and even, with a still lower blow room loss and equal in colour. As also its ginning percentage over 20 acres of cultivation worked out at nearly 28 per cent. as compared to just over 25 per cent. for the cotton obtained from bulk selection of seed it is a promising strain. Again as it also matures much more evenly it should prove suitable to Rāmnād district which will be a great advantage. Six other single plant strains which had been grown up to field scale on the farms were put out into the villages in 20-acre blocks with a view to obtaining the results of spinning tests on these. Our most cordial thanks are due to Messrs. Harvey & Co. for their assistance in this matter as results from actual spinning tests are much safer guide than valuations based on small handfuls of lint. Selection of types is in progress. Similar work is in progress at Hagari and Nandyal but is not so far advanced. The annual reports of the stations show that there are some promising strains both as regards yield and ginning percentage under examination, but the cottons of these tracts were originally very badly mixed (*vide* Mr. Benson's report of 1906 quoted in G.O. No. 243,

Revenue, dated 24th January 1914) and cross fertilization has proved a difficulty especially at Nandyal. Further reference to cotton and paddy will be found in the report of the Economic Botanist.

20. *Groundnut.*—Work on this is mostly confined to Palur where some 13 varieties have been regularly cultivated for some time and cultural experiments have been in progress. This work is likely to become immediately important once more as with the boom in groundnuts, the area under this crop has expanded very rapidly and with it complaints have come from Marseilles as to a steady deterioration in the percentage of oil. With ordinary careful cultivation this ought to be impossible. It is wrong to cultivate groundnut as a pure crop year after year on the same soil. Experiments have now been in progress at Palur comparing the results of growing groundnut regularly on the same land or of growing it mixed with a cereal tenai or cumbu, or alternating it with these cereals. On the latter plots neither has the total crop yield of groundnut decreased nor the oil content deteriorated—it still gives 49·84 per cent. of oil as a rain-fed crop as compared with 46 per cent. in 1906 and 48·8 per cent. in 1907 and in addition these plots show an average annual money profit over seven years over the pure groundnut crop of Rs. 28, Rs. 35 and Rs. 38 per acre. A considerable amount of knowledge is being obtained about the 13 varieties which are regularly being grown at Palur and they are becoming acclimatized so that they will be ready in case of need, but whilst some of them especially a Barbados variety and West African are promising Local Mauritius when properly cultivated maintains an uniformly high position in the list. This is partly due to the high percentage of kernel to nut it possesses. In the other varieties there is greater proportion of husk. But on account of the complaints from Marseilles more attention will be again paid to groundnut this year. It is not merely a question of seed, the method of shelling also affects the ultimate product.

21. *Sorghum.*—Most work in the way of selection is in progress at Hagari where the object in view is not only to get a heavier yielding strain but also, if possible, to get that on a plant with a dull grey midrib along the leaf. It is found that there are two well marked lines, one in which the midrib of the leaf is dead white in colour, is pithy and does not make succulent fodder, the other in which the midrib is a dull grey, is a sweeter plant and gives better fodder. The results are not complete yet and some of the seed selected had obviously been cross-fertilised because in one case at least the resulting plants split up on true Mendelian lines. At Koilpatti and Coimbatore, Periya manjal cholam sown thickly formed an excellent fodder crop. At Coimbatore the land had been carefully cultivated and in spite of the dry weather an average yield of 670 lbs. per acre was obtained from the dry land. Seed for trial in subsequent years was selected from some of the plants which had most obviously resisted the drought best.

22. *Cumbu, ragi and Italian millet.*—Nearly all work on cumbu was marked by misfortune. At Coimbatore the newly introduced varieties all failed. With ragi the problem of whether to sow it in beds or on ridges was again tested at Hagari and Coimbatore. The conclusions at the former station would seem to show that it is mainly a question of care in the formation of the beds or ridges; given this care the out-turns are practically the same. At Coimbatore also it would appear that the difference is not in the yield but in a more economical use of water to the extent of about 20 per cent. Selections of ragi are also being tried at Hagari. At Hagari Italian millet failed but selection work is in progress at Coimbatore.

23. *Pepper.*—The crop was on the whole good and the total yield was the highest ever attained at Taliparamba, viz., 3,926 Madras measures of green pepper. Of the various manurial plots the one treated with line and leaf mould continues to give the best results and improving ones. From $5\frac{3}{4}$ Madras measures of pepper in 1906–07 it steadily increased to 113 in 1911–12, to 140 in 1912–13 and last year reached $217\frac{3}{4}$ Madras measures. Some of the younger vines which had been planted to replace deaths are now coming into bearing but the best testimony to the efficacy of this treatment is afforded by the uniformly steady improvement in the average yield of the old vines, viz., from ·05 and ·24 Madras measures per vine in 1906–07, and 1907–08 to ·66 and ·79 Madras

measures in 1912–13 and last year. The only other plot which shows a constant improvement in the average annual yield of the old vines is the one treated with cattle manure, which has progressed more slowly and irregularly. Whilst shade is essential for the growth of pepper it not infrequently happens that the live Murugu standards which are the ones mostly used die before the vines cease bearing. Consequently an attempt has been made to train vines on dead standards under shade. They are just coming into bearing and are promising well. It is somewhat difficult in a West Coast garden to get uniform plots at all suitable for comparing different varieties, but the best arrangements possible were made and the three main West Coast varieties, viz., Utterankotta, Balamkotta and Kalluvalli are being grown against each other. The Balamkotta vines commenced to yield first but the Kalluvalli are now overtaking them in yield per vine. The Utterankotta which is a purely female vine is naturally lagging behind. It has to rely on stray pollen for fertilization.

Other crops.

24. Mr. Barry continued his work with Sumatra and Havana tobacco on the Gōdāvari lankas with very fair success. Difficulties in connection with curing and cultivation are still troubling him, though almost needless to say the crops he raised are much better than those to be seen locally and the arrangements for curing are also superior. At Taliparamba they are engaged in working out a system of rotation of crops suitable for the extensive wastes of North Malabar. The adoption of any such system in place of the present temporary cultivation of hill paddy will increase the total production of the country enormously. The price of ginger has unfortunately fallen very heavily this year. But American cowpeas have answered and one variety of ragi has stood the climate and yielded grain at rates comparable with that on garden land on the East Coast.

Indigo.

25. With the aid of several of the mills and local firms an experiment was made to test the value of the late Baron Schrottky's method of making indigo paste. Very careful supervision was kept over it in every stage and repeated dyeing tests were made with it at the mills. It failed badly. As a dyeing reagent the mills valued it at only about As. 3 or so a pound. Thanks are especially due to Messrs. Ripley & Co. Carl Simon and Söhne, Best & Co. and the Anglo-Textile Mills for the assistance they gave.

Live-stock.

26. *Fodder crops.*—In India any consideration of live-stock at once raises the question of fodder, and the establishment of any useful heavy yielding fodder crop would be a great help in solving questions connected with cattle. So far fodder cholam is probably the cheapest; but two exotics suggested by Mr. Sampson were tried last year at Coimbatore with very fair prospect. One known as "silver Swiss chord or silver beet" the seed of which was obtained from Paris yielded 25,300 lbs. of green leaf per acre and was readily eaten by the cows; fodder cholam yields about 13,500 lbs. of green food per acre. The other exotic tried was a fine grass from South Africa—Teff Grass—which grew well and was left to seed. The straw—about 1,300 lbs. to the acre—formed good food for cattle.

27. *Cattle.*—The dairy at Coimbatore was working continuously throughout the year for the first time and 66,932 lbs. of milk were handled. Most was sold on the Estate but 1,358 lbs. of butter were made and sold outside. The stock on the farm had increased so largely that two auction sales were held at which 42 cows, buffaloes and heifers were sold and 39 young stock. Very good prices were obtained, and better than were anticipated. By this means the general level of the herd has been improved but by no stretch of the imagination could it be considered a good dairy herd as judged by western standards. The best cow yielded only 20 lbs. (2 gallons) of milk a day. At the request of Sir Frederick Nicholson, K.C.I.E., a rather novel feeding experiment was carried out. Four heifers were fed for some months regularly on fish, dholl husk and rice bran, another four had similar rations but groundnut cake and cotton seed in place of fish. There was no

difficulty in getting the cattle to eat the fish diet and no ill-effects from it were noticed. Further investigation is necessary.

On the West Coast practically all the cattle are purchased from outside. A small herd has been started at Taliparamba chiefly to provide cattle manure and to graze down the grass and the calves that have been born have done very well so far. It would seem to be chiefly a matter of care when the cattle are young.

Orders were received from Government on Mr. Sampson's cattle survey report shortly after the close of the financial year.

28. *Sheep.*—All the work that is being done on sheep is being done by Mr. Hilson at Hagari who started two years ago by purchasing some animals from local herds. The object was primarily to improve the yield and quality of wool for which there is a market. But the local breed is such a mixture, showing variations as distinct as those from a Dorset Horn to a Scotch Black Face that it is necessary to obtain something which is white and very fairly true to type before introducing foreign blood. To this end work is directed. But as it is the wool has received favourable comments from the mills at Bangalore and the weight of the fleece is improving slowly. The flock did well during the year as 15 out of the 16 ewes dropped lambs of which two were lost later. Unfortunately most were rams. Three tup hoggs in good condition not fat fetched Rs. 11, Rs. 9 and Rs. 7, respectively, in the Bellary market. At the end of the year the flock numbered 36.

B.—Chemistry.

29. The year was a very busy one in the chemical section, the report on which is published as Appendix III. Besides doing a great deal of original research work, and the teaching and investigational work which falls naturally to the work of this section, much analytical and bacteriological work was done for other officers, *e.g.*, analyses of milk were made daily for the Principal, sugarcanes were analysed for Dr. Barber and the Deputy Directors and some bacteriological work was done for Mr. McRae. Thus the total number of analyses 2,853 were more than double those of last year of which 66 were made on behalf of cultivators and landowners. The Soil Survey of Tanjore delta has been completed and published as a bulletin since the close of the year. A beginning has been made with that of Guntūr. Material has also been collected for a bulletin on common fodders of the Presidency, but it will take a little time to work it up. The memoir referred to in last year's report was submitted to Pusa and was accepted and published by them. It has been generally well received. The enquiry which started with the examination of the gases in paddy soils has extended the examining the effect of green manuring in increasing the æration of the roots of paddy and towards an investigation of the nitrogen and carbon cycles in swamp soils. Mr. Harrison hopes soon to be able to prepare another memoir on the work which he has since done. He and his section deserve great credit for the progress and uniformly high standard of work of the section throughout the year.

C.—Economic Botany.

30. Mr. Parnell only joined duty on May 13, 1913, and his first report is printed as Appendix IV. It was decided that he should pay almost his whole attention to the improvement of two crops by plant breeding, viz., paddy and cotton. For this purpose he visited the chief paddy growing areas, studied methods of crossing, etc., besides doing a lot of preliminary work in the way of harvesting small plots, etc., with a view to determine the experimental error which he may anticipate in his work. The farm wet land is too uneven to allow him to carry on much work there and it will be necessary to provide him with a small block of more uniform land for testing his different strains. Somewhat similar work has been done with cotton, the varieties of which have been planted out in the Botanical garden in which much work has been done in putting the uncultivated portion into order. One post of Assistant is vacant as a thoroughly satisfactory applicant for the post has not been found. It will naturally be some years before results can be expected from this plant breeding study, but the work has been started in a methodical manner.

D.—General Botany.

31. The whole field of Botany is so large that the teaching and systematic work is in independent charge of a different gazetted officer M.R.Ry. Rai Bahadur K. Rangachariyar Avargal whose report is printed as Appendix V. Very much of the Botanist's time was necessarily occupied with teaching and the extent of obligation under which he will place the department will chiefly be measured by the quality of the boys he turns out. They did well in their botanical examinations. But his work does not stop with lecturing. Most of his vacations have been spent on tour collecting specimens for the herbarium, for which in the year he and his staff collected 1,700 specimens. In the year 2,059 sheets were mounted and 1,067 sheets incorporated in the herbarium. Arrangements had been made with Kew that Mr. Gamble would prepare a complete work on the Madras Flora if the sheets in the herbarium were sent to him. He was able to start work last year and during the year 6,792 sheets were sent to him from the herbarium. The departure of Sir Alfred and Lady Bourne from the Presidency has deprived us of two contributors to the herbarium, the loss of whose help we much regret. In their time they had added about 900 sheets to the collection. During the year 370 specimens were identified for different correspondents.

E.—Entomology.

32. The feature of the year in this section has undoubtedly been the preparation by Mr. T. Bainbrigge Fletcher of a book entitled "Some South Indian Insects and other animals of Economic Importance." It is very well written, well illustrated, chiefly with new and original illustrations, and well arranged. The work was done speedily and thoroughly and is already in type and will very shortly be published by the Government Press. It was fortunate that at the time the collections were being examined there was an officer in charge with the wide knowledge of tropical entomology that Mr. Fletcher possesses and the work should not only prove useful to officers of the department but should be of general interest. For the rest no very serious outbreak of insect attack occurred during the year. Efforts were again made to induce the people in Bellary and Kurnool to adopt preventive measures against the Deccan grasshopper but with little success. Demonstration work failed entirely on account of the season. The crops grown on the fields on which preventive measures had been taken withered through lack of rain and consequently the demonstration was useless. No remedy has as yet been found for the cotton stem borer beyond plucking up and burning the stalks after an attack and not allowing any of the old crop to remain on the ground for a second year. This proved to be sufficient at the Coimbatore farm. Mr. Fletcher carried out a series of experiments at the request of Government to determine the part played by bees in the pollination of coffee. His report has been received and though the results are not very conclusive it appears that Apis dorsata plays a considerable part in this work.

33. *Sericulture.*—A temporary fieldman who had previously been trained in the Tata Silk school at Bangalore was sent to Bengal for a month's training there and was then posted to Kollegal. He has certainly got to know the people engaged in silk rearing and persuaded a few to adopt more cleanly methods. Steps have been taken to enable him to raise disease free seed during the current year to test whether there is a real local demand for such. If there be not any it will hardly be worth while continuing with silk. All attempts to raise silk worms at Coimbatore have failed. The climate is too hot and dry. A trial will be made this year with seed from Europe obtained through the Salvation Army, Simla.

F.—Mycology.

34. Mr. McRae's report is printed as Appendix VII. As in previous years the most widespread fungoid disease with which the department had to cope was the bud-rot on palmyras in Gōdāvari and Kistna. The method of attack was further developed during the year and before the close of the year *the method* was driven still one step further. Hitherto it had been customary to cut only dead trees

although Mr. McRae had shown that infected trees if operated upon in the earlier stages would recover. And as an infected tree may remain a centre of infection for three years or more it is obviously necessary to operate upon infected trees if the disease is ever to be brought under control. This was accordingly started in the year although there was some opposition at first. In the year in the two districts 100,741 trees (71,341 dead and 29,400 infected) were cut. Towards the end of the year a further step was made by persuading the villages round Chikkala in the Kistna upland to cut all their large trees in the infected area and search for signs of disease and operate at once. By this means 12,066 palms were examined, of which 966 were found to be diseased although no outward signs were visible. It is hoped that by these stricter measures the virulence of the disease may be abated; such seems to be the case in the Kistna and there are indications of hope in Gōdāvari. The disease on coconuts on the West Coast was during the year identified as due to the same fungus as that on palmyras in Gōdāvari. It is more widespread than was at first expected but in intensity it fortunately does not compare with the disease in the Gōdāvari. One thousand nine hundred and twenty-six diseased palms have been cut in Malabar. At the end of the year it was reported that the root disease of coconut had appeared in British Cochin. Another campaign was undertaken against Mahali both in South Malabar and in the extreme north of South Canara. Altogether 14,000 areca palms were sprayed as compared with 2,100 in the previous year. Some of the villagers did the work themselves; but the disease was not so severe as in the previous year.

The supervision of all this district work hampered investigation in the laboratory although some 33 applications for advice were received from outside. In the present state of knowledge of tropical diseases it is usually necessary to inspect the disease *in situ* before any remedy can be suggested. Thus the section finds considerable difficulty in keeping abreast of its work as all the staff may frequently be out on tour at once. The most interesting result on the lines of research was the isolation of the fungus causing the bud-rot in the Gōdāvari and the demonstration by cross inoculation that this was also the cause of the bud-rot of coconuts. It had never previously been isolated and other investigators had doubted whether the disease was really due to a fungus at all. This established it definitely. Mr. Shaw has prepared a bulletin on the matter for Pusa which is being issued.

G.—The Sugarcane Breeding Station.

35. Dr. Barber's report is published as Appendix VIII. All connected with the station had a very busy time in getting the land and station into working order and in dealing with the large mass of seedlings, all of which have to be examined and tested and characteristics recorded. The whole prospect of success in work such as this lies in the hope that great variation may be found to exist among the canes raised from seed, and that such variation was occurring was patent to every visitor to the cane station. Some canes shot up high and strong, others sprawled across the ground, others were short and stunted, some were obviously maturing more rapidly than others and so on. Analyses of the canes have shown that large variations have also been found in the sucrose contents and purity. In addition to those mentioned by Dr. Barber in his report one seedling in bulk crushing has since shown over 20 per cent. sucrose with more than 91 per cent. purity. The idea of the work is to send those canes which Dr. Barber considers promising to the farms in Northern India for trial there. It is unfortunate that none of the Northern Indian canes brought to Madras have flowered this year. They have now been planted on all the farms where sugarcane is grown in the hope that they may flower at some of them. Dr. Coleman, Director of Agriculture, Mysore, very kindly gave great assistance for which we are indebted. In fact all officers have co-operated with Dr. Barber to assist him as they were able. All applications for increased staff or revised pay of staff were accepted by the Government. There was however very much to do in laying out the station and attending to the seedlings which required constant attention. On this no pains were spared by the Sugarcane Expert and his senior assistants. Dr. Barber made several long tours in Northern India studying local conditions and making arrangements for his

work. In collaboration with the Punjab officers he has prepared a monograph on the Punjab canes.

H.—Pisciculture.

36. Sir Frederick Nicholson, K.C.I.E., contributes the following summary of the work of the Fisheries Department. His more detailed report appears as Appendix IX to which reference is requested.

Fresh water.—Mr. H. C. Wilson was in charge of this branch as in previous years.

Researches, followed by important practical operations, were carried out in connection with larvicides for anti-malarial purposes. The tanks and wells of Cuddapah were all stocked with selected larvicides and a site selected at Pedda Gadi for breeding these and for natural stocking each year of the Bugga river and Dongala Cheruvu. Cochin was visited with Major Ross, I.M.S., in connection with elephantiasis. A complete survey of the mosquito-breeding grounds of the town was made. Many wells and ponds were stocked with fish larvicides and other places treated with kerosine.

A report was jointly drawn up dealing with the whole question of mosquito-breeding grounds and advising the opening up of all the canals to tidal influence and other measures found necessary to deal with these numerous danger zones.

A site has been selected at Ippur, Nellore district, and a fishery and hatchery have been designed for breeding and distributing larvicides on a large scale. This takes the place of the previous schemes of Kanigiri and Allur, both of which have had to be abandoned, the former for public works' reasons, the latter because of the salinity of the water-supply.

A number of tanks were stocked during the year as well as some 60 and odd miles of the Kurnool-Cuddapah canal from the Sunkesula fish farm, Kurnool district, where piscicultural work was actively carried on during the year.

The live fish market at Kurnool was completed and will be opened this year.

Research operations were carried out in connection with the breeding, etc., of *Ophiocephalus punctatus* and *O. striatus* and designs for scientific appliances for this work drawn up.

O. striatus and *O. punctatus* were grown at Sunkesula fish farm and marketed at Kurnool.

The Hilsa hatchery was in operation for a brief time.

The Nilgiri streams are well stocked with trout and the fishing season re-opened on the 1st June. Some live fish food was acclimatised and introduced into the streams (Carradina).

Trout eggs were put down at Avalanche hatcheries for the Punjab Government and Travancore. Unfortunately the former were unable to send for these. They eventually hatched and turned out very strong and healthy fry.

A paper on the treatment of swamps, stream-beds, ponds, wells, etc., for destruction of mosquito larvæ was drawn up by Mr. Wilson with photos of the most useful larvicides and will be issued to the public shortly.

Marine.—The piscicultural part of Mr. Hornell's work mainly lay in the culture of edible oysters at the Pulicat experimental farm, and in researches connected with the early life history of the pearl oyster.

The former was very successful considering the brief duration of the experiment and our present inability to detach a separate expert for its superintendence. The oysters were fit for sale within fourteen months of spat fall and in two months thereafter 21,450 were sold; there is large stock of fine oysters for 1915. As an experiment in the possibilities and method of culture it is a decided success and, when further developed, will point the way for commercial enterprise.

Important facts were ascertained with regard to the larval pearl oyster, Mr. Hornell's researches showing that the young oyster is capable of dispersal for a longer period and to much greater distances than has hitherto been deemed possible.

Mr. Hornell has also drawn up a complete scheme for the culture of the pearl oyster and of pearls under direct control, in a farm designed for the purpose;

the site selected is on an island close to Pāmban and was recently inspected by His Excellency the Governor.

The building of the fish farm of 160 acres in a lagoon close to Tuticorin was delayed owing to the non-arrival of the necessary material from England, but everything is now ready on the spot for work during the current year.

Mr. Hornell while on privilege leave examined the methods of mussel culture in the south of France, and the information obtained will shortly be put to practical use.

V.—DEMONSTRATION, AID TO THE PUBLIC, SHOWS, AGRICULTURAL ASSOCIATIONS AND GENERAL PROGRESS.

37. The vagaries of the season considerably hampered demonstrational and district work in some parts especially in Chittoor and Bellary districts otherwise work proceeded on the whole on similar lines as in the previous year but on a wider scale.

38. *Sugarcane.*—Work in connection with this crop has been mostly confined to South Canara on which two officers were out during the cane season. The work that has had to be done consisted not only of the substitution of a new variety of cane for a local one, but the substitution of the iron mill for the wooden one, and a complete alteration in the design of the furnace. Actual crushing experiments on ryots' land show that the joint effect of the adoption of these results is to increase the value of the produce by Rs. 122½ per acre. 35 mills were sold during the year and it is reported that the new furnaces are being found very suitable for boiling rice. Mr. Couchman who has rendered very great help in all work in South Canara reports that the area known to have been cultivated with Red Mauritius cane in 1914 was 193·8 acres as compared with 83·6 acres in 1913. The total area may not seem large but on the West Coast cane is not cultivated in large blocks but scattered about in many homesteads. A start was made with work in Kasaragod taluk.

39. *Cotton.*—As hitherto district work on cotton has been practically confined to Tinnevelly, Bellary and Kurnool districts. In Tinnevelly the work connected with cotton developed greatly, in Bellary the season was badly against it. In Tinnevelly 378 acres of seed farm were cultivated with seed from bulk selection in October 1912 and from it 89,448 lbs. of improved seed were sold in 18 village depôts as compared with 58,350 lbs. in the previous year. A quantity of seed was thus sold sufficient for more than 10,500 acres. In addition the produce of the single plant strain upon which Messrs. Harvey & Co. reported so favourably (*vide* paragraph 19 above), was sown on over 300 acres. Arrangements are being made to collect the produce of this strain and have it ginned separately to prevent chance of mixture; so that it is expected that in October of this current year about 7,000 acres will be under this special quality. Another satisfactory feature possessed by this strain of Karunganni is that it matures uniformly and early and consequently is suited to the conditions of Rāmnād district. It has been tried this year in the neighbourhood of Sivākasi and arrangements are being made to post an officer to Virudupatti to open up cotton work in that neighbourhood. The real experiment of the year has however been in the direction of co-operative sale. Allusion was made last year to the difficulty that was found in ensuring that this improved seed when sent to the villages was kept pure. The crop was sold to the small dealer, who took it mixed with his other purchases to the gin. It was inevitable that the seed he took back was a mixture of the selected and local kinds. In order to meet this difficulty the firms were asked whether they would not clean out their gins and gin separately any consignment of pure Karunganni brought to them direct by the villagers with an assurance from the departmental officer that that village had used departmental seed. Three villages somewhat timorously agreed to do so. And as a result two agricultural co-operative societies have been formed to carry on this work, and some 25 other villages have stated that they intended to try this system. One of the villages which did so last year certainly cleared an extra Rs. 3 per 250 lbs. of kappas over what they would have made if they had sold it locally besides having their own supply of good seed.

Also as at the gins they are paid by the actual quantity of lint obtained they reap the profit they are entitled to for growing a cotton with a higher ginning percentage. Similarly especially in the case of the selected variety which has just been reported upon the firms obtain in bulk unmixed a cotton of better quality, greater strength and more uniform—*i.e.*, qualities which they require. It may be said that there is no guarantee of honest dealing on the part of these societies, but the system brings the producers into direct touch with the chief market and so cases of mixing can be brought home more rapidly and more directly. At the same time the ryots know they are growing better cotton which they can only keep pure by some organisation which means additional work and care on their part and they ought to get a slightly enhanced price on account of the quality. I am glad to say that at least one firm in Tinnevelly has appreciated this point and is giving a slightly higher rate for consignments of the selected strain which are brought in pure.

In Bellary and Kurnool work was continued on the same lines as previously. In the two previous years there had been a great demand for farm seed and in the two districts the sales had risen from 14,700 lbs. to 44,000 lbs. to 84,132 lbs. Arrangements were accordingly made to meet a still further demand and 928 acres were cultivated on seed farm conditions in the two districts. The yields however were poor throughout these districts and in Bellary some kappas which had been grown by ryots from our seed but not on seed farms was bought. The result was at the sowing time in 1913, 36,866 lbs. of seed were ready, but the sowing rains held off so long that many ryots gave up altogether any idea of sowing cotton and others objected to use a fuzzy coated seed which, Hagari No. 1, is for late sowings. This point was tested in the year on the farm and in the villages and there seems to be no difference in the yield. Finally only 5,842 lbs. of seed were sold in Bellary and though the price obtained for it was 20 per cent. above the market rate this is disappointing. In Kurnool the work received no such check but the 1912 season was poor and the yield from the seed farms was short. All the seed available, viz., 35,190 lbs. was sold readily at 20 per cent. above ordinary rates. The total sales in the three districts were over 130,000 lbs. of seed. The gross outlay was Rs. 44,148 and receipts Rs. 29,761. Financially this was the worst year there has been, owing to the season in Bellary and consequent decrease in demand and to expenses connected with demonstrating the use of drills in Tinnevelly and collecting and testing the strains of cotton. The check in the Ceded districts was unfortunate as the Managing Director of the Buckingham Mills had commented upon the improvement which was becoming noticeable in the cotton from the Nandyal neighbourhood.

40. *Drill cultivation in Tinnevelly.*—Concurrently with the introduction of better strains of cotton into Tinnevelly, attempts have been made to introduce the drill and harrow and to substitute the system of sowing in rows for that of broad casting. In the year 49 local men were trained in the use of the implements apart from those who picked it up in the villages, 35 sets of implements were sold as compared with 14 in the previous year, and within the knowledge of officers in the department these implements are now in use in 80 black-soil villages. The area actually drilled by the ryots themselves in 1913–14, as far as was ascertained was 7,117 acres, as compared with 3,773 in the previous year. Year by year the area over which these implements have been used has increased without check. On this work and on that connected with cotton reference is requested to Mr. Sampson's report in Appendix II.

41. *Cambodia cotton.*—This is now thoroughly established especially in the south of the Presidency and only about 9,000 lbs. of seed was sold from the various farms. Complaints as to its deterioration are, I regret, common; although none such are made when samples are shown of the crop grown as it should be under wells. India is not a new country like the Sudan where it is possible by regulation to restrict the cultivation of one type of cotton to one tract. When it has been shown that a new introduction such as Cambodia cotton does yield high profits cultivated under wells people will risk growing it on their dry land and if, as was the case in Coimbatore, they are favoured at first with one or two seasons of good rain and so are able to reap good profits even on dry land, they will continue to grow it on such

land, although the quality of the produce cannot compare with that cultivated under wells. And until the trade in this cotton is better organised so that grades in it are recognized and payments made accordingly it is difficult to see how mixing of the different qualities can be prevented. The late dry season in Coimbatore was fatal to the Cambodia cotton grown on dry land, but it remains to be seen whether this will suffice to check the cultivation of it on such land in future.

42. *Paddy.*—There is a ready sale for all the seed raised on the Government Farms. It is not the progeny of single plant strains but is well filled, mature seed, very fairly true to type, grown from single seedlings. Over 20,600 lbs. were sold from Samalkota for seed purposes at 10 per cent. over market rates. Patimannu work, which has been described in previous reports, was started in Guntūr district.

43. *Seed rate.*—The practice of sowing single seedlings or at least of reducing very considerably the quantity of seed used continues to spread and it is impossible now to estimate the area affected. It is, however, certain that in the floods in South Arcot the fields which had been transplanted with single seedlings were not so severely damaged as other fields.

44. Immediately after the floods in South Arcot were known the Deputy Director of the Southern Division arranged to get seed of short term varieties from Tinnevelly for distribution among the ryots to enable them to resow their fields. Seven thousand eight hundred and ten pounds of such seed were sent to the Deputy Collector, Chidambaram, and to the Tahsildars for sale and much of it was sold or distributed. It did fairly although of course the season was late.

45. *Green-manuring.*—Arrangements were made to stock a larger supply of green manure seeds than previously and more than three times the quantity was disposed of than in the previous year. In all more than 120,000 lbs. of green manure seeds were disposed of as against 60,000 in the previous year. Distribution in the south was mostly confined to Madura, the Shiyali taluk of Tanjore, Chingleput, South Arcot and Chittoor, although a promising start was also made in the Northern Division. The actual area over which they were used with success is difficult to determine because in Madura private trade is taking up the work to some extent, some fields have been so well sown that the kulinji now re-seeds itself and in others the seed did not grow well or sometimes did not even germinate owing to a failure of the showers usually expected in April and to shortage of irrigation water. The daincha seed was again obtained from Bengal. It was only delivered four months after order and much of it was bad. Chingleput took 32,453 lbs. of green-manuring seeds, although it has not been possible to spare trained men to work that district thoroughly. The development of this work has really only just begun and it is impossible to estimate the ultimate demand which will arise when trained men are sent to push it in the rice districts. In Malabar cowpeas are being tried by a few as a green-manuring crop.

46. *Intensive dry cultivation in Malabar.*—In the neighbourhood of Taliparamba farm there has been a considerable increase in intensive dry land cultivation which system it is hoped will in time supplant the reckless system of punam cultivation customary there. It is very unfortunate that a heavy fall in the price of ginger should have occurred just when the system was gaining ground, as that was one of the most profitable crops in the rotation. But still by the cultivation of ginger the land is so well turned and treated that the subsequent dry paddy crop benefits. One ryot this year got over 1,600 lbs. of modan (*i.e.*, hill paddy) per acre off a field after ginger—a yield never associated with this crop.

47. *Touring officers.*—Independently of the cotton work officers have been posted this year continuously to Madura, Chittoor and Coimbatore purely for district work. On the West Coast also the farm staff has done a very large amount of touring on district work. In Madura these officers have been chiefly engaged on green manuring work; in Chittoor single seedling and green manuring were the chief objects of work but the season hampered progress badly, *e.g.*, Chittoor and Madanapalle taluks only received about half their customary rainfall and frequently there was no opportunity to sow green manure seeds. In Coimbatore although the season was equally bad a much better start has been made especially in the Bhavani valley. Several ryots also were persuaded to try fish manure on

garden or wet lands. The area was too large to supervise adequately but the fish manure was generally successful and many applications for it from Coimbatore and the more eastern districts were received. A special journey was made to the West Coast to arrange for the supply but the catch of sardines has failed this year.

The new farm at Anakapalle has already begun to exert some influence locally, in the way of improvements in the cultivation of sugarcane and paddy.

48. It is difficult to gauge accurately the extent to which improvements are spreading. Some at times receive an unanticipated check, *e.g.*, cotton in Bellary, whilst others have been adopted in remote corners. It has never been possible to spare a man for detailed work in Ongole and Nellore. The Chief Assistant was sent thither this year for enquiries connected with cattle and in a village close to Addanki he found several of them were steeping their cholam seed in copper sulphate on the lines explained in the Agricultural Calendar as a preventive against smut from which the cholam in the village had suffered badly. It appears that one ryot in the course of a tour of the temples of the south had met a Reddi from Tinnevelly who advised him to go and see Koilpatti farm during his travels. He did so and nothing more happened. Later the village schoolmaster got his Telugu copy of the Agricultural Calendar—they are sent to all schools—and read out this article on smut. The ryot thereupon enquired if there was anything in the Calendar about Koilpatti. He was told there was; so he concluded it was worth while trying copper sulphate solution for smut. He did so and last year the owners of between 300 and 400 acres of land in that village were washing their seed in this solution before sowing.

49. *Implements.*—As already stated about 35 iron mills have been sold in South Canara, the same number of drills in Tinnevelly, 27 scind ploughs and 13 triangular harrows from Palur besides a few ploughs through the agency of the Central Farm, Coimbatore.

50. *Cattle shows.*—Cattle shows were held during the year at Ongole, Tiruppur and Madura. The first two were good but detailed reports on these are submitted by the Superintendent, the Veterinary Department. Agricultural lectures and demonstrations were given amongst other places at Tiruppur, Madura, Pudukkōttai, the district Co-operative meeting in Tanjore, the Cochin State exhibition at Ernakulam, and at a meeting at Chidambaram.

51. *Agricultural associations.*—Of the old District Associations Ganjām appears to show most vitality. It is hoped that it will be possible to give it some attention now that a farm has been established at Anakapalle but really more men in the department are required. Coimbatore has again run a very successful show at Tiruppur, but otherwise has not much to record. Kumbakōnam is still working with very fair success on the lines which it had already marked out. Of the others I cannot say much. The Honorary Secretaries of the Central Agricultural Committee, especially Diwan Bahadur M.R.Ry. M. Audinarayana Ayya, have spent much effort on this, touring throughout the Presidency endeavouring to stimulate interest in such organizations. My report has already been submitted to the Board and in the conditions that at present exist I fail to see how this committee can realize any of the objects set forth in Mr. Beauchamp's note except enquiry into the local conditions in villages with a view to opening agricultural co-operative societies.

52. The greatest hope, so far as agricultural associations are concerned, lies in two new types. The Malabar District Agricultural Association has almost ceased to exist as such. But through the aid of the Collector and of a few of the members of that old association it has been possible to organize 23 village associations which concentrated their attention on one work—the economic planting of paddy. The officers who had been stationed at Taliparamba for some time helped in the selection of centres and of presidents. The result was that generally men were appointed presidents who were directly interested in agriculture and kept the members to their work. Each association was an association of workers who concentrated on one task and who were visited repeatedly by the staff at Taliparamba. No reports were asked for or written. But at the end of the year the

members were assembled and general experiences discussed. It is far too early to express any opinion on these societies but some, especially those in North Malabar and Wallavanad and Ernad taluks, worked well. Palghat was not nearly so successful.

The other type is the true agricultural co-operative society formed for some definite profitable purpose. The two which are the direct outcome of the cotton work in Tinnevelly have been described above. Another one has been registered in one of the wet land villages near Madura and proposals have been received for three in Chingleput district. These last are partly the work of Diwan Bahadur M.R.Ry. Audinarayana Ayya and of Mr. Mehta. It is a subject in which considerable local enquiry is first of all essential.

53. *General progress.*—The amount of correspondence with literate ryots continues to increase. Although the Southern Division was reduced by the excision of three districts and one farm the Deputy Director received in the year 1843 applications for advice direct from private parties independent of those received at the farms. Prices have continued to be high and trade has been good, all of which tends to stimulate interest in matters agricultural. One feature has been the increasing number of enquiries about cattle and implements. More and more attention is being paid to manures and manuring especially in the south and west which means more money in circulation. If attention be confined to the year's work, the chief features in the districts may be summarised as follows :—

(*a*) the spreading on a larger scale than hitherto of the improvements already advocated by the department although cotton work in Bellary received a check ;

(*b*) the foundation of the first agricultural co-operative societies excluding Bapatla ;

(*c*) the trial of village societies in Malabar ;

(*d*) further development in the methods carried out against certain known crop diseases ;

(*e*) the increased number of enquiries about cattle and implements ;

(*f*) the starting of continuous district work in two more districts.

(*g*) Just about 300,000 lbs. of seed of different kinds were sold for seed purposes by the department mostly in small lots.

If attention be turned to the work so to speak within the department from which it is hoped that still further advances in district work will ultimately accrue the main points are—

(*a*) the revision of the courses at Coimbatore so as to allow of twice the number of students being admitted ;

(*b*) the receipt of orders from Government regarding cattle ;

(*c*) the submission of proposals for the reorganisation and development of the department ;

(*d*) the successful first year's working of the sugar-cane station ;

(*e*) the continuation of Mr. Harrison's work on paddy soils and the manurial experiments connected with them and the arrival of a whole time Botanist for plant breeding ;

(*f*) Mr. Fletcher's book on Entomology ; and

(*g*) the opening of two more district farms—one at Sirvel for special objects in connection with the Velgode project and one in the Circars.

But yet coconuts, cattle, cambodia cotton, and many of the dry crops remain practically untouched ; several districts are practically never visited and the lines of work already started are continually developing. It is more trained men in the districts for local study and local work that is required. The Government are prepared to sanction posts, the difficulty is to fill them with suitably trained men. The sole fear I have for the future is that more may be undertaken than the strength of the department will permit. If the energies of the officers ever become entirely absorbed in keeping current work going there is the end of improvement.

VI.—AGRICULTURAL ENGINEERING.

54. In this Presidency this is really under an entirely independent officer, viz., the Director of Industries, and it seems rather absurd to refer only to implements under the heading of Agricultural Engineering. The boldest attempt in the Presidency so far has been made by Messrs. Parry & Co. at Nellikuppam, who have successfully ploughed, harrowed and trenched their sugar-cane land there by means of steam tackle. At Coimbatore 120 acres of dry land were put at the disposal of the Director of Industries to try a motor tractor and ploughs. Considerable further trial will be needed before this becomes a practical proposition. The best work on dry lands has been done by the disc ploughs which at Coimbatore have proved most useful. When Mr. Wood went on leave he took with him samples of Indian grains to see whether cheap suitable winnowers could be obtained. One is now out on trial. Several varieties of ploughs have been tried suited for different purposes, of which the monsoon plough has done satisfactory work on light soils, *e.g.*, gardens.

VII.—PUBLICATIONS AND SUPPLY OF INFORMATION.

55. The following bulletins and leaflets were issued during the year; some of them with the help, or by the Veterinary officers of the Veterinary Department :—

Note No.		
1913.		
1. List of Insect-pests of Cultivated Plants in Southern India.	Mr. T. Bainbrigge Fletcher.	English.
2. The preparation of Bordeaux Mixture for the treatment of Mahali.	Mr. F. J. F. Shaw	Malayalam.
Leaflet No.		
4. Flies Spoiling Toddy in South Canara.	Mr. T. Bainbrigge Fletcher.	English. Canarese.
5. Training of Practical Cultivators, Maistries or Field Coolies.	Mr. D. T. Chadwick	English. Tamil. Telugu. Malayalam.
6. What the Ryot has to say about single seedling planting of paddy.	Mr. Natesa Ayyar, Agaram, North Arcot district.	English. Tamil.
7. The Mahali Disease of Arecanuts ...	Mr. F. J. F. Shaw	English. Malayalam.
8. Castration and Mulling	Mr. F. Ware	English. Tamil.
9. Single seedling transplanting of paddy.	Mr. K. P. Karuthirama Goundan.	English. Tamil.
10. The But-Rot of Coconut Palms in Malabar district.	Mr. W. McRae and Mr. F. J. F. Shaw.	English. Malayalam.
11. Ill-effects of communal grazing ...	Mr. D. T. Chadwick and Mr. F. Ware.	English. Tamil. Telugu. Malayalam. Canarese.
Bulletin No.		
67. Note on insects attacking the paddy plant in Southern India.	Mr. T. Bainbrigge Fletcher.	English.
1914.		
68. A soil survey of the Tanjore delta ...	Mr. W. H. Harrison ...	English.
Leaflet No.		
1. Practical Instructions for the Kollegal Mulberry-silk worm rearers.	Mr. T. Bainbrigge Fletcher.	English. Canarese.
2. The advantages of co-operative sale of cotton.	Mr. H. C. Sampson	English. Tamil.

Very large numbers of the leaflets were sent to Tahsildars and Revenue Inspectors for distribution. Over 72,000 copies of the Agricultural Calendar which is published in five languages were distributed. Extracts in Uriya were also published by the Collector in the District Gazette of Ganjām.

VIII.—STATISTICS.

56. *Crop forecasts and crop-cutting experiments.*—Nineteen crop forecasts dealing with the sowings and outturns of paddy, cotton, sugar-cane, gingelly, groundnut, castor and indigo were issued. Considerable efforts were made to improve these returns especially those for paddy, cotton and groundnut—88 crop-cutting experiments on ryots' land were performed for statistical purposes by officers of the department, but as the harvests on the farms and in the neighbourhood must necessarily clash it is difficult to spare men for this work.

IX.—MISCELLANEOUS.

57. Mr. Sampson and Mr. Harrison served on the Madras Sewage Farm Committee; the former officer also inspected the Ootacamund farm at the request of that Council. Amongst other special reports submitted to the Government were one on cinchona in the Anaimalais and a preliminary one on seedling farms in the Kistna. It is again a pleasure to record that the whole staff has worked well. District and farm work has been very good at Taliparamba and Koilpatti and the Manager has tackled Anakapalle in a vigorous and business-like manner. There has been much improvement at the farm at Hagari. Most people are anxious and ready to sympathize with work tending towards agricultural improvement and it may seem somewhat invidious to mention two names, but it would be wrong not to acknowledge the heavy debt the department is under to Mr. Couchman and to Mr. Innes for much ready help and beyond all to His Excellency the Governor who has taken every opportunity of seeing what work is in progress and whose active interest does much to smooth the way of future development and progress.

MADRAS,
24th June 1914.

D. T. CHADWICK,
Director of Agriculture.

APPENDIX I.

ADMINISTRATION REPORT OF THE AGRICULTURAL COLLEGE, RESEARCH INSTITUTE AND CENTRAL FARM, COIMBATORE, FOR THE YEAR 1913–14.

College.—Of the items of work still remaining to complete the college, the museum and the rain water-supply have been completed during the year under report. The work of stocking the museum, and making it an integral part of the college teaching, it is now the duty of the staff to take up. The electric light and suction and pressure pumps have not yet been installed. Some relief has been given by the construction of new quarters, but expansion has been proceeding rapidly since the request for these was made, and there is still an insufficiency; this is, I believe, to be remedied. Sanction has also been accorded to the purchase of some lines put up by one of the contractors, which are to be put in order by the Public Works Department and at once made occupied.

During the visit of the Board of Agriculture in December, the estate post office was temporarily converted into a combined post and telegraph office, an arrangement which to the great convenience of the residents, has now been made permanent. The name of this office which is to serve both this and the Forest College is "Lawley Road," and this will in future form part of the address.

Telephonic communication was installed between my office and the Farm office: it is not yet in proper order, but has already proved most useful.

2. *Visitors.*—His Excellency the Governor of Madras, Lord Pentland, visited the College in April 1913, whilst in December the Board of Agriculture met at the College. Then some 80 officers and others had to be accommodated on the estate with their clerks and servants. Sir John Atkinson, K.C.S.I., welcomed the visitors, among whom was Sir Robert Carlyle, K.C.I.E. Sir Harold Stuart, K.C.V.O., K.C.S.I., visited the college at the time of the College Day, while later in the year, Lord Islington and some members of the Public Service Commission, put in a week end. Of the twenty-five honorary visitors, three visited the college during the year: their remarks were duly forwarded to the Government. The Director of Agriculture paid six visits during the year.

3. *Students.*—At the commencement of the session, there were 50 students in all, 9 in their last year, 18 in their second, 20 new students and 3 special students. Of the second year 15 students remained, and of the first 18. A new arrangement was adopted this year, of selecting a rather larger number than were actually to be taken in, and putting them through a week's probation, picking the 20 best students.

Allusion may here be made to the new courses which are to be introduced from next June. Briefly, instead of giving a single three years course, starting with pure science, and working through applied science to agriculture, two courses are to be given, the second in continuation of the first. The first will be a thoroughly practical course of agriculture, including practical agriculture, manual training in carpentry and blacksmithy, and dairy work, but omitting all pure science and laboratory work. The second course leads on from this, and is to be an eighteen months course of pure and applied science.

The reasons for this change have been fully set out in the note placed before the Board of Agriculture. It is gratifying to note that the Madras proposals were not only accepted, but were recommended to the attention of other agricultural colleges.

It will be possible to increase the numbers under training and it is proposed to recruit 40 students each year. Applications to the number of 66 have been received to date.

4. *Teaching.*—Little change is to be noted. The teaching of dairying is still suspended, for want of a suitable teacher; while the staff is so shorthanded, it is impossible to spare a man for the work.

The usual district tours were taken: the first in October to the West Coast, the second in January to North Arcot, Chittoor, Cuddapah, Bellary and Anantapur. The tours were arranged in consultation with the Deputy Directors concerned, and carried through with the assistance of their staffs.

The Implement Museum has recently been constructed, and is being stocked. Students (and others) should be able to get from it a clear idea of what ploughs and other implements are likely to be useful, the price at which they can be got, and the dealers who stock them. Thanks are due to one or two firms who supplied specimens free or at a reduced price.

Chemistry.—During the year, the first-year students received 49 lectures in Inorganic Chemistry, 44 lectures in Organic Chemistry and 61 classes in Practical Chemistry. In addition they also had 34 lectures in Physics.

Sixty lectures were given in Agricultural Chemistry to the second-year students who also had 28 classes in Practical Chemistry.

No change was made in the course of studies and the attendance throughout was very satisfactory.

Botany.—This subject was taught for five terms, the first three terms being devoted to the teaching of the general principles of plant nutrition and the other two terms to the study of crops, horticultural operations and the broad facts connected with plant-breeding.

During the first year, 58 lectures were given and 76 practical classes were held. The second-year course consisted of 71 lectures and the same number of practical classes.

For the Diploma Examination fifteen students were sent and fourteen of them passed (four in first class, four in second and six in third); one failed.

Mycology.—The course in plant diseases to the students was extended to three months and was given in the last term of the second year. On three mornings a week, three hours were devoted to the study. The course, which was mainly practical, comprised the life-histories of a saprophyte and a parasite, the general characters of parasitic fungi, the principal diseases of the more important crops of the Presidency and methods of prevention. The students are now in a position to observe a fungus disease on a crop, to choose suitable material and send it properly preserved to the laboratory for detailed examination and to apply intelligently any preventive remedy suggested. An examination was held at the end of the term and of the fifteen students who presented themselves, four were placed in the first class, six in the second and five in the third. Dr. L. C. Coleman, Director of Agriculture, Mysore, was the external examiner.

Entomology.—The second year students, fifteen in number, were put through a course in Entomology consisting of three hours a week of which two hours were devoted to field work and one to lectures.

The examination for the Diploma was held at the end of the year by the Imperial Entomologist, Mr. T. Bainbrigge Fletcher.

All the students passed; five were marked in the first class, eight in the second and two in the third.

5. *Examinations.*—The third year were examined for the Diploma by Mr. Evans, Deputy Director of Agriculture in the Central Provinces, Mr. Ware, and Mr. Tressler, associated with the College staff, and it is satisfactory to be able to record that all passed. The second year were similarly successful, there being only two failures, one in Agricultural Botany and one in Agricultural Chemistry; the outside examiners were—Agricultural Chemistry, Mr. Plyman; Agricultural Botany, Dr. Burns; Entomology, Mr. Bainbrigge Fletcher; and Mycology, Dr. Coleman. The Robertson and Clogstoun medals fell to K. Ramayya, a student from Madura; he was just beaten for the Keess prize by Gopalakrishnama Raju.

6. *Library.*—During the year, 278 books have been added to the Library, at a cost of Rs. 1,028. One hundred and seventy were purchased; 96 sent by the Government Mycologist and the Government Entomologist; and the rest were obtained free by presentation or by exchange. Good progress has been made with the binding. Six hundred books have been completed this year, but there are still arrears to be worked off, and the work will be pushed on. The catalogue of pamphlets, bulletins, etc., has received a set back owing to the loss of a batch of cards in the press. This will mean going through all the pamphlets again, to run down the missing entries. The collection of photographs and lantern slides was increased by 83 and 143 respectively.

7. *The Students' club.*—Expenditure this year outran receipts and the year closed with a depleted balance. We have received great assistance in the shape of a grant from the Government for the construction of a new tennis court and the repair of our old ones, and for this we are grateful. The increase in the number of students will perhaps ease matters, but there is a deal which requires doing.

The Tennis cup presented by the last winner, B. Dwarakanath, was again played for this season, and was won by Budhavidheya Rao. The Sports Championship cup was won by Rajagopal G. Mal for the second time. The Madras Agricultural Students' Union is progressing steadily. The publication mentioned in last year's report appears on the whole regularly and is readable. It serves a useful purpose, and there is no doubt that the union is doing good in keeping us all together, past and present, students and teachers.

8. *Hostel.*—M.R.Ry. R. V. Subrahmanya Ayyar vacated the office of Warden on the 12th February when his place was taken by M.R.Ry. Tadulinga Mudaliyar. High prices continue and make the Warden's post one of some difficulty; an actual loss of Rs. 37 occurred as the result of the year's accounts, which is however more than met by the increase of the Reserve Fund. Much honorary service in the way of helping on the Mess Committee, and auditing the accounts, is given by the senior members of the colony, and the thanks of the Hostel are due to them.

The discipline and behaviour of the students was as usual good.

9. *Sanitary.*—The work of conservancy is on the increase, with the growing size of the colony, and the sanitary staff has been increased to keep pace with it. Poudrette is regularly manufactured and used for farm crops, while it is hoped to use the sullage water from the quarters for irrigation purposes. Plague occurred in the surrounding villages: the necessary precautions were taken, and the colony fortunately remained free. Seventy-five of the staff and servants were inoculated: mostly those whose business took them regularly into the town. The number of deaths during the year was five: the same number of births was recorded.

10. *The Farm.*—The season was most unfavourable. The rainfall was the minimum recorded since the Farm commenced. The general excellence of the Farm methods of cultivation was evident, and did much to counteract the evil effects of the drought, though the crops were naturally much below their average. Experimental work is still being reduced, as experience shows that the experiment was incorrectly designed in the beginning, or was laid out in an unsuitable site or finally that the staff have too much other work to be able to attend to it properly. Changes in the areas and divisions of some of the fields, generally in the way of enlarging them by merging two fields into one, are making them more amenable to the bigger and heavier types of plough we are using, among which the disc plough may be specially mentioned.

11. *Livestock.*—The first livestock sale was held during the year, and it is hoped that this will now become an annual affair. During the year 94 animals were sold, and the numbers were reduced from 246 to 200; the quality has correspondingly increased.

Our bulls are increasingly popular, and an extra one or two will have to be invested in shortly.

The general programme remains the same; to improve the dairy-herd by line-breeding and selection, and to keep a few Kangayam cows to supply us with bullocks and to see whether rearing working cattle as a branch of ordinary arable farming is at present prices a profitable business; the quality of the animals bred will affect this question materially. The hospital continues to be popular and provides plenty of material for the classes; 467 cases were treated from outside during the year, a slight diminution, due to the closure of the hospital which was thought necessary for a short time owing to the prevalence of foot and mouth and black quarter in the neighbourhood.

12. *The Dairy.*—The feeding and management of the dairy-herd was transferred to the Farm from May last, and the dairy simply acts as a purchaser of milk from the Farm. The milk handled during the year was nearly 67,000 lbs., over 50,000 coming from the Farm here and 16,000 being purchased from outside. The bulk of the milk is issued fresh, but 1,358 lbs. of butter were made during the year. A profit of Rs. 100 is the result of the year's working.

13. *Staff.*—I was on combined leave for six months from the 25th April to the 25th October. I was desirous of taking some study leave to go through a dairy course, but this was not found possible; Mr. Sampson acted for me during this period while M.R.Ry. J. Chelvaranga Raju acted as Assistant Director of Agriculture in the same division but continued to work here. On the 12th November, Mr. Thomas, Probationary Deputy Director, joined duty here, and after assisting me in various ways, took over the duties of Farm Manager, on the departure of M.R.Ry. Tirumuruganatham Pillai on the 3rd February; he left on the 18th March. I may call attention to the stimulus which Farm work received generally, before he became Farm Manager; he was able for instance to devote a good deal of time to the feeding of the cows and young stock and the management of the dairy and this has resulted in considerable improvement; there is little doubt that a far larger staff than it is at present possible to post here could be *usefully* employed, either in teaching or investigational work. The teaching staff remained the same during the year; the bulk of the lecturing and general arrangement of the practical classes is done by the Principal, who is thus the Professor in Agriculture; his two assistants divide between themselves the supervision of the practical field classes, and the perusal and correction of the students' observation note-books; a most important branch of the teaching of this subject and one which is well attended to. Mr. D'Silva has been in practically independent charge of the teaching of Veterinary Science, and has reason to be satisfied with the performance of the class in the Diploma examination. Engineering and Surveying was taught by M.R.Ry. R. V. Subrahmanya Ayyar until he left in February on long leave. The post of Farm Manager was held until the 26th May by M.R.Ry. Balakrishnamurti when he handed over to M.R.Ry. Tirumuruganatham Pillai. After Mr. Thomas' departure, M.R.Ry. Rajagopala Achari took over. The Farm staff worked well; their hours are long, and it is rare to see any of them joining the College staff in the evenings at the club. I have tried so far as possible to let each Assistant Farm Manager get an occasional holiday by putting special students in charge of their blocks for the day. An attempt was made to do some district work after the appointment of Assistant Farm Manager Bhandari in June, and one Farm Manager was at work in this and Salem districts until the beginning of February, when he was transferred to the Southern Division which took over all district work.

The direction in which further staff, if approved, can be most usefully employed is in the dairy, and in the supervision of the livestock, and in the more careful harvesting and storing of selected seeds.

Profit and loss account for the year ending 31*st March* 191 .

Dr. Cr.

	Rs.	Rs.		Rs.	Rs.
To amount as per valuation, March 31, 1913—			By receipts	...	24,504
Dairy (*a*)	8,988		By amount as per valuation, March 31, 1914—		
Livestock (*b*)	7,194		Dairy (*a*)	6,321	
Tillage and standing crops ...	2,722		Livestock (*b*)	9,045	
Produce in store	4,933		Tillage and standing crops ...	1,421	
Implements	6,977		Produce in store	4,863	
Machinery	16,448		Implements	9,090	
Buildings and estate improvements.	57,139		Machinery	16,160	
		1,04,401	Buildings and estate improvements.	58,505	
					1,05,405
To charges during the year ...	...	42,221	By balance being loss.	...	16,713
		1,46,622			1,46,622

(*a*) Includes dairy-herd and stud bulls. (*b*) Working cattle only.

Coimbatore,
11*th May* 1914.

R. CECIL WOOD,
Principal.

APPENDIX II.

THE ADMINISTRATION REPORTS OF THE AGRICULTURAL STATIONS DURING THE YEAR 1913-14.

Administration Report of the Deputy Director of Agriculture, Northern Division, for the year 1913-14.

I have the honour to submit the administration report of my division for the year 1913-14.

1. *Staff.*—Except for one month spent on privilege leave, during which time M.R.Ry. D. Ananda Rao Garu, Assistant Director of Agriculture, Northern Division, was in charge, I remained in charge of the division throughout the year. Three hundred and six days were spent in camp and the farms at Hagari, Nandyal, Samalkota and Anakapalle were visited thirteen, ten, nine and four times, respectively, and besides the usual visits paid to the Agricultural College at Coimbatore, I attended the Agricultural Conference held there in December 1913. Tours were also made in the districts of Bellary, Kurnool and Gōdāvari and Vizagapatam and the farms of Koilpatti and Manganallur were visited.

M.R.Ry. D. Ananda Rao, while in charge, toured for 24 days and visited Hagari, Nandyal and Samalkota farms once each.

During the year a sub-division comprising the districts of Kurnool, Cuddapah, Guntūr and Kistna was formed and the Assistant Director was put in immediate charge of the district work in the sub-division and the farms at Nandyal and Sirvel.

My charge was reduced by the inclusion of Chittoor in the new charge formed as the central division.

2. *District work—Cotton Improvement work—*(*a*) *Local cotton.*—Except for small changes in the agreements made with seed-farm ryots in the Bellary circle work was carried out on exactly similar lines as last year. In the Bellary circle, the cotton being distributed is the produce of a single plant selected in 1907 It is a fuzzy-seeded Herbaceum type ginning 27·3 per cent. (the local average is 25 per cent.) and yielding an equal amount of better quality lint, in respect of length and colour to the local cotton.

As the demand for this cotton last year was greater than the supply, arrangements were made this year to have a larger supply available. The sowing rains were however unduly late and the heavy demand expected was not realised, and only 5,842 lbs. of seed were disposed of.

This is almost entirely due to the belief that the ryots of this locality have in the greater suitability of a mixture of fuzzy-seeded and clean-seeded cottons, with the latter preponderating for a year of this nature,—a belief that this year's experience on the farm and outside hardly seems to warrant. Comparative plots of the above selected strain and of clean-seeded cotton have given equal yields of produce, but the difference in ginning percentage is nearly 5 against the clean-seeded cotton.

Seven hundred and twenty-one acres of seed farm were sown to produce seed for distribution next year.

In the Nandyal circle the cotton now being distributed is the produce of a single plant selected in 1907. This is also a fuzzy-seeded Herbaceum type, ginning 30 per cent. (the local average is here also 25 per cent.) and which except in point of yield, in which it is equal, is superior in every way to the local mixture.

During the year 681 acres were sown with this cotton to provide seed for next year and 34,190 lbs. of seed were sold. The smallness of the quantity disposed of this year as compared with last year is due to the poor yields obtained from the seed-farms.

(*b*) *Cambodia cotton.*—As in last year, kappas was bought locally, ginned and the seed was distributed. The demand for this seed is not now very keen as there is enough seed in the district. Altogether 7,000 lbs. of seed were sold mostly in the Ceded districts.

(*c*) *Sugarcane*—(1) *Distribution of canes.*—There was no demand for canes at Samalkota, but at Anakapalle station in the neighbourhood of which B. 208 is coming into favour there was a brisk demand for setts. Altogether 34,850 setts of the three varieties Keli, Bonta and B. 208 were disposed of.

(2) *Improvement in cultivation.*—This year only 30 acres were planted out in rows under the supervision of the farm staff. Owing to the fall in the price of jaggery (raw sugar) the cultivation of this crop is decreasing in this district. The improvement is one which is not regarded with any enthusiasm by the cultivator as the benefit obtained does not lie in a heavier yield, but in the greater ease with which propping, wrapping, etc., can be done and he does not see any further than the initial trouble in changing his method of planting.

(*d*) *Paddy*—(1) *Improvement in cultivation.*—In Gōdāvari, 53 ryots sowed thin seed-beds over an area of 17·5 acres, and 465·68 acres were transplanted with single seedlings. This area comprises only the area so planted for demonstration purposes, and does not include that planted by the ryots themselves. The main point aimed at in this work is the reduction of the seed-rate and where work has been carried on for a few years, the adoption of a reduced rate is gradually but slowly increasing.

(2) *Seed-distribution.*—Two thousand one hundred and one pounds of Garikasannawari were distributed from Samalkota for the present second crop season. For the main crop season of 1913 the total quantity of seed of these two varieties Konamani and Rasangi was 12,489 lbs. and 6,027 lbs. respectively. This seed has merely the merit of being pure, *i.e.*, it is not a mixture of the varieties grown locally; sound, well-filled and of good germinating capacity and is not the produce of selected strains. The supply available is limited and is easily disposed of at a rate 10 per cent. higher than is given for local seed.

(*e*) *Green-manure.*—Three thousand five hundred and forty-nine pounds of green manure seeds chiefly sesbania were distributed mainly from Samalkota farm. Distribution is however continuing and more seed will be disposed of.

3. *Implements.*—The gallows plough was tested both at Hagari and Nandyal. In the garden at Hagari, in soil in which a fair amount of moisture was present, the plough did excellent work, but the smaller E.T. plough is equally satisfactory for this purpose, is not so expensive and does not need so many bullocks to pull it. On the dry black soil it has the same defect as the old black-cotton soil plough in that it does not leave a clean furrow.

A two-furrow disc plough was obtained from Messrs. Octavius Steel & Co., Calcutta, and tried on the black soil. Where it could cut into the soil it did good work and left a clean furrow, but some parts of the field in which it was tried were too hard and here it did not work properly. Further trial is however needed.

Hagari Agricultural Station.

Season.—The season was one of short rainfall, badly distributed, and was on the whole unfavourable. The early crops failed entirely, sorghum gave yields below the average and cotton gave good yields.

2. *Dry crops*—(*a*) *Cotton.*—This crop was sown late, but the absence of rain during its growing season was in its favour and the yields obtained cannot be complained of. The average-acre yield was this year 273 lbs. of kappas, over an area of 41·43 acres. This is distinctly better than last year when the figure was 182 but not so good as the previous year when the average yield was 376 lbs. of kappas per acre. In that year the rainfall was less than was received this year but it was better distributed. The best yield (309 lbs. per acre) was obtained from cotton No. 1 over an area of 3·20 acres in field No. 13.

(*b*) *Sorghum.*—This crop suffered from late sowing and the absence of rain during the growing season. 65·73 acres were put down under this crop and an average-acre yield of 329 lbs. of grain and 1,019 lbs. of straw were obtained. The figures last year were 635 and 1,609 respectively. The best yield was obtained from field No. 8 from 5 acres of bazaar sorghum which gave the average outturn of 563 lbs. of grain and 1,607 lbs. of straw.

(*c*) *Bengal gram.*—The short rainfall told against this crop and the yields are not good. From an area of 15·65 acres an average yield of 224 lbs. per acre was obtained, the best yield being 237 lbs. per acre from 8·65 acres in field No. 5. These figures compare unfavourably with last year's results which were 445 and 709 respectively.

(*d*) *Safflower.*—This crop was grown on an area of 5·50 acres on the rotation plots in fields Nos. 4 and 5 and gave an average acre yield of 428 lbs. The best yield, viz., 635 lbs. per acre was obtained from one of the plots which was cropped last year with Italian millet.

3. *Garden crops*—(*a*) *Ragi.*—This crop was cultivated over an area of 2·77 acres and gave the poor average outturn of 1,082 lbs. of grain and 1,810 lbs. of straw per acre.

(*b*) *Sugarcane.*—The dry season told against this crop, which was only fair and made irrigation expenses heavy. From an area of 60 cents an acre yield of 35,357 lbs. of cane and 3,721 lbs. of raw sugar were obtained. Last year the area under cane was 40 cents from which an acre yield of 29,813 lbs. of cane was obtained, which was however not crushed.

(*c*) *Onion.*—This crop was satisfactory and gave an acre-yield of 12,074 lbs. of bulbs dried and ready for market.

(*d*) *Cambodia cotton.*—This crop grew fairly well on the heavier soil in the garden, but was attacked by aphis. The yield obtained from a 40-cent. plot was at the rate of 631 lbs. of kappas per acre. In this district it is not worth while attempting to get a second flush as during the hot weather the bolls do not open properly and the crop merely serves as a harbour for pests. On this account very heavy yields are not likely to be obtained.

(*e*) *Chillies.*—This crop was grown over an area of 1·21 acres and gave an average acre-yield of 3,594 lbs. of green and 200 lbs. of ripe chillies.

4. *Distribution of seed*—

	LBS.
Hagari No. 1 selected from local cotton	5,842
Cambodia cotton	2,803
Miscellaneous	258

5. *Sheep.*—The flock did very well during the year, and 15 out of the 16 breeding ewes dropped lambs, which were unfortunately mostly all rams. There were two casualties among the lambs. Three tup hoggs in thriving condition but not fat were sold in Bellary market for Rs. 11, Rs. 9 and Rs. 7 respectively. There is a demand for good mutton there and at these prices sheep breeding will pay.

The flock, as it stood at the end of the official year, consisted of 36 individuals, 2 rams, 21 breeding ewes and 13 lambs.

6. *Staff.*—Farm Manager M.R.Ry. S. Ramaswami Pillai was in charge of the Farm till 1st October 1913 when he handed over charge to Farm Manager M.R.Ry. K. Narayana Ayyangar, who joined this agricultural station on 12th May 1913 from Kurnool. Assistant Farm Manager G. R. Venkatachalapati remained in charge of garden cultivation to the end of the year. Assistant Farm Manager V. S. Subrahmanya Sastri was transferred from Samalkota and joined duty on 15th July 1913. Assistant Farm Manager T. S. Venkatarama Ayyar remained till the 14th April 1913 when he proceeded on privilege leave for three months and while on leave was transferred to the Sugarcane station, Coimbatore. M.R.Ry. L. S. Natesa Ayyar remained at this station up to 12th May 1913 when he was allowed to go on combined privilege leave and furlough for 7 months and 21 days and, on his return from leave, was transferred to Anakapalle where he joined on the 4th January 1914.

Samalkota Agricultural Station.

Season.—The rainfall was up to the average and the season was on the whole favourable.

2. *Crops*—(*a*) *Sugarcane.*—This crop was planted in good time and grew very well. The stand was good and there was very little red rot disease though more than last year, 2·2 per cent. as against ·5 (point five). The yields obtained were good and are about a record for the farm. The area of crushed cane was 3·04 acres and the outturn per acre 10,563 lbs. of raw sugar. The best yield this year was obtained from a 10-cent. plot of B. 3412 which yielded at the rate of 14,160 lbs. of raw sugar per acre.

(*b*) *Paddy.*—This crop also did very well and though most of it lodged, this did not happen until after the grain had set. The average acre-yield for the whole area under this crop for the main crop season was 3,037 lbs. grain and 4,436 lbs. straw as against 3,586 lbs. grain and 5,278 lbs. straw last year.

Rasangi on an area of 4·62 acres, and Konamani on 14·1 acres gave acre-yields of 3,406 and 3,074 lbs. grain and 3,615 and 4,688 lbs. of straw respectively.

There was very little smut this year.

Regarding the question of lodging conditions were very favourable this year and as far as weather conditions were concerned the crop had no excuse for lodging. It was however noticeable that on all the plots which had received green-manure this year the crop lodged, while on those which were not manured the crop stood till harvest.

The effect of the heavy dressings of green-manure has been to increase the growth of straw considerably as will be seen from the results obtained from fields Nos. 10 and 11 and 17 and 18.

Field No. 10	3,245 lbs. of straw per acre	Rasangi.
„ 11	4,982 „ „ „	
„ 17	6,324 lbs. of straw per acre.	Konamani.
„ 18	4,062 „ „ „	

Fields Nos. 11 and 17 were green-manured with teegapesalu.

The same effect is to be noticed from the application of paddy straw—

Complete manure	4,250 lbs. of straw per acre.
Complete manure *plus* 5 tons paddy straw per acre	6,330 „ „ „

The beneficial effect of a heavy dressing of 2,000 lbs. of green-manure on a sticky field is marked, but after the condition of such a field has been ameliorated it is not advisable to continue to apply the manure so heavily, as there is always risk of bad weather at flowering time which, if the crop is luxuriant, will cause it to lodge, and much of the grain will be empty.

How much and at what intervals, green-manure should be applied is a question for experiment, the answer to which will vary greatly with the kind of land and previous treatment.

(*c*) *Green-manure crops.*—Sesbania, teegapesalu (Phaseolus mungo) and Sunnhemp were as usual grown as ante-monsoon crops and all gave heavy crops of green-manure.

With reference to conditions prevailing in Kistna and Guntūr districts an attempt was made to find a green-manure crop which could be mixed with sunnhemp and which would cover the ground after that crop had been cut for fodder purposes. Sunnhemp was sown in the standing crop of paddy as is done in the districts referred to and across it in three strips, sesbania, indigo, and Cassia tora were sown. The sunnhemp was cut in February. No irrigation was given after the sowing of sunnhemp, and after its removal the land cracked badly and the green-manure crops made very little growth. Cassia tora did best, but unless rains are received during the hot weather there is little likelihood that any quantity of green-manure will be obtained.

(*d*) *Dry crops.*—Dry paddy was grown pure and as a mixture with red-gram and with Cambodia and Cambodia was also grown pure. As a mixed crop dry paddy gave an average acre-yield of 1,220 lbs. grain and 2,772 lbs. of straw and as a pure crop 2,175 lbs. of grain and 3,372 lbs. of straw. The good yields obtained from the pure crop point to the possibility of this crop yielding as well as a regular wet crop, if treated more as a garden crop and an experiment has been devised to test the point.

Cambodia as a pure crop was attacked by leaf-curler and aphis and the yields are not good. The average acre-yield being only 533 lbs. As a mixed crop it was more healthy and is giving a second picking consequently final figures are not yet to hand.

3. *Seed distribution*—

	Crop. 1913–14. LBS.	Crop. 1912–13. LBS.
Paddy—		
Konamani	12,489	
Rasangi	6,027	13,565
Other varieties	4,540	
Green-manure seeds	3,549	1,633

4. *Staff.*—M.R.Ry. V. Muthuswami Ayyar remained in charge of the farm to the end of the year and was assisted by M.R.Ry. N. Seetharamaswami Nayudu who was appointed as Farm Manager, second grade, from 1st April 1913. M.R.Ry. V. S. Subrahmanya Sastri, who was transferred from the Central Farm, joined duty on 16th April 1913 and remained till the 12th July 1913 when he was transferred to Hagari. M.R.Ry. S. Subbayya continued throughout the year assisting the manager in charge and in the district work. M.R.Ry. D. Panakala Rao appointed as probationer joined on the 7th July 1913. S. Anantarama Sastri, a probationer, resigned his post on 1st May 1913.

Anakapalle Agricultural Station.

The site of this station was acquired in the month of June of the year under report and comprises 41 acres, of which 10 acres have been set aside for dry cultivation, 10 acres for garden cultivation, 18 acres for wet cultivation and the remainder utilised for buildings, roads, bunds, etc. Actual possession of the greater portion of the land was however not obtained until August and of the remainder until March 1914. Very little work has therefore been done except to erect buildings and to fence and lay out the land, which work is practically finished.

2. *Season.*—There were 58 rainy days in the year and a total rainfall of 35·07 inches, and though in these respects conditions were not much below normal, the season was unfavourable. A long spell of dry weather in July-August spoilt the rain-fed grain crops and the practical failure of the north-east monsoon rains lowered the yields of paddy.

3. *Crops*—(*a*) *Paddy.*—The following varieties, Mypali, Azzanum, Bobbiliganti, Maharajabogan and Balaramabogan were cultivated on 15·18 acres and gave an average acre-yield of 1,723 lbs. of grain and 1,820 lbs. of straw. This figure is low owing to some of the fields having been transplanted late and to the failure of rain mentioned above. The best yield was obtained from 52 cents of Bobbiliganti in field No. 18 which yielded at the rate of 2,583 lbs. of grain and 2,385 lbs. of straw per acre. Considering that this field had already borne an early crop, this yield was good.

The seed-beds for this crop were sown at the rate of 360 lbs. per acre, just about one-sixth of the local rate. This rate was generally considered by the local cultivators to be too low, and two of them backed their opinion of the superiority of the local rate by sowing extra seed-beds in order to supply the farm with seedlings "at a price." The farm seed-beds, however, proved sufficient for requirements and we were able to offer a few seedlings for sale. The progress of the crop was closely watched by the ryots who had previously cultivated the land and they expressed their intention of reducing their own seed-rate though not to so low a rate as 360 lbs., as they calculated that by so doing they would save about Rs. 5 per acre in seed and labour.

(*b*) *Sugarcane.*—Two fields of cane had to be taken over from cultivators who did not wish to carry on until the end of the season as the other ryots cultivating within the farm area had agreed to do. These two fields were manured with castor-cake, a practice unknown round Anakapalle and gave satisfactory returns. Only one field, a mixture of Bonta and Keli was crushed entirely and yielded raw sugar at the rate of 8,978 lbs. per acre; the other field was a mixture of the above two canes with B. 208 in addition. B. 208 was reserved for distribution and some Bonta and Keli canes were also distributed. The remainder gave an outturn of 8,823 lbs. of raw sugar per acre. It is expected that next season the use of castor-cake as a manure for sugarcane will be tried by several cultivators.

4. *Seed distribution.*—17,500, 13,600 and 3,750 setts respectively of Keli, B. 208 and Bonta sugar cane and a small quantity of Cambodia cotton were distributed during the year.

5. *Staff.*—Farm Manager D. Balakrishnamurthi was in charge of the farm throughout the year. Farm Manager L. S. Natesa Ayyar joined duty on the 4th January 1914, and Assistant Farm Manager Bhairy Siva Rao appointed on probation, joined on the 10th July 1913.

G. R. HILSON,
Dy. Director of Agriculture, Northern Division.

7th May 1914.

Administration Report of the Assistant Director of Agriculture, Northern Division, for the year 1913–14.

I have the honour to submit the administration report of the sub-division under my charge for the year 1913-14.

Staff.—I was on duty throughout the year and in addition to my own work, I acted for the Deputy Director of Agriculture, Northern Division, during May 1913. The sub-division was created in August 1913 and comprises the districts of Kistna, Guntūr, Kurnool and Cuddapah, including the agricultural stations of Nandyal and Sirvel. My head-quarters was transferred from Rajahmundry to Bezwada in January 1914. I spent 279 days in camp and visited the Nandyal agricultural station eight times. District tours were conducted during the year in Vizagapatam, Gōdāvari, Kistna, Guntūr, Kurnool and Chittoor. Since the creation of the sub-division my clerical staff was increased from one to three.

Farm Manager T. V. Rajagopala Achari, who was stationed at Ellore, was on special duty throughout the year. He was on privilege leave for one month from 7th May to 6th June 1913. He was in charge of district work in general in the Kistna and Guntūr and especially of Patimannu experiments in the Guntūr delta. He was transferred to Coimbatore on 9th March 1914 and nobody has yet taken his place.

DISTRICT WORK.

(*a*) *Cotton improvement.*—The improvement of cotton in Kurnool was continued as before by seed selection and distribution of good seed. Seed is distributed free to some ryots of selected villages and land assessment is paid in addition. Cotton kappas are purchased from them at the highest market rates. This year the produce from about 660 acres of seed farm was purchased and ginned on the farm. The demand for seed was so great that although requisitions came even from Cuddapah, almost all the seed was sold at the door. Small quantities were, however, sold through the Tahsildars of Koilkuntla, Sirvel and Nandikotkur at their request. That the ryots are anxious to purchase the Sircar cotton seed is evidenced from the fact that all the seed was purchased at 26 lbs. per rupee when local seed was selling at 35 lbs. per rupee. In addition to 35,190 lbs. of seed sold, 5,400 lbs. of Sircar cotton seed was supplied to the seed farms. Of the 651 acres under seed farms, 530 acres were sown from seed obtained from selection No. 2, the balance from ordinary Sircar cotton.

(*b*) *Cambodia cotton.*—2,580 lbs. of this cotton was sold during the year, part of which was sent to Kistna and Gōdāvari for sale locally. There does not seem to be much demand for it here, as the district seems to have a plentiful supply of the same.

(*c*) *Green manures.*—Owing to many demands from outside for dhaincha it was decided to grow it on ryots' lands. A start was made this year near Nandyal where 12 acres were taken on lease and dhaincha was grown mixed partly with dry paddy and partly with korra (Setaria Italica). It yielded 1,925 lbs. of dhaincha, 1,916 lbs. of paddy and 44 lbs. of korra grain besides straw from the latter two. The dhaincha, however, smothered the paddy which gave only a poor yield and the season was late for the Bengalgram which followed. The experiment was therefore not financially successful. But in future there is a hope of the cultivation of dhaincha being taken up by ryots themselves as an attempt made during last season in this direction resulted in the purchase of 2,032 lbs. from ryots in villages surrounding the farm who were given 41 lbs. of dhaincha seed to be sown in their dry crops. The cultivation and harvesting expenses were met by the ryots themselves who in return were paid at 4 Madras measures per rupee for seed sold to the department.

Wild indigo.—For the first time 953 lbs. of wild indigo were obtained in Kurnool district for distribution.

(*d*) *Paddy.*—The demonstration plot at Nandyal was continued like the previous year with little promise of success. Although the first crop paid itself, the concern ended in a loss when the second crop is taken into consideration which was due to imperfect water-supply which resulted in partial crop of grain and straw.

(*e*) *Patimannu experiments.*—These experiments were conducted in the Guntūr district for the first time, similar to those formerly conducted in the Kistna, with slight modifications. Dhaincha which was sown as a green manure having failed, two bags of black castor cake and 1 cwt. of super-phosphates per acre were applied to plots selected in seven places in the deltaic portion of the district with encouraging results. Indigo is being grown this year but with what success it is too early at present to say.

Nandyal Agricultural Station.

Season.—Similar to the two previous years, the rainfall was below average. Thunder-storms in May and heavy rains in early June and July did little good for the main sowing and cotton had to be sown when there was very little rain and sorghum when the rains were very heavy and the prolonged drought which followed did not improve the conditions so that the season may be considered only fair both for cotton and sorghum.

Crops.

Cotton.—The area under this crop was 12·70 acres, which yielded on the average 230 lbs. of kappas per acre. The best yield was obtained from selection No. 50 grown on a 20 cent plot which gave at the rate of 440 lbs. per acre.

Sorghum.—An area of 58 acres was occupied by sorghum which produced a total yield of 32,665 lbs. of grain and 76,665 lbs. of straw or on the average gave 563 lbs. of grain and 1,321 lbs. of straw per acre. Compared with last year the yield is considered good but 40 acres of it was grown in the new extension in which all the crops the previous year were more or less a failure.

Bengalgram.—This crop occupied an area of 13 acres and yielded at 183 lbs. per acre. This low yield is attributed to its having been sown in the non-experimental area occupied mainly by the borders of fields which are unfit for experimental work.

Fodder sorghum.—This occupied 2·75 acres on low land, but did badly yielding at the rate of 4,588 lbs. of green fodder per acre.

Seed distribution.—The following seeds were sold on the farm during the year :—

	LBS.
Local cotton	35,190
Cambodia cotton	2,580
Dhaincha	1,907
Indigo	3,095
Sorghum	196

Implements.—There were six applicants for a loan of the black cotton soil plough who were all complied with; besides, two sets of local agricultural implements were supplied to two applicants.

New works and improvements.—The quarters for the clerk and two cooly sheds were the two additions to the buildings on the farm and a temporary shed for storing cotton was also completed. A latrine and some outhouses are under construction. The new area acquired in 1912–13 was properly fenced in and a live hedge of Babul all round was started during the season.

Visitors.—The agricultural station continues to attract the attention not only of the ordinary ryot but that of cotton merchants from far and near.

Staff.—Farm Manager M. Raghavulu Nayudu besides being in charge of the farm throughout the year, was responsible for the district work including cotton improvement. In addition he helped me in the preparation of estimates and in other matters connected with the starting of the Sirvel Agricultural Station which he did ungrudgingly. Assistant Farm Manager V. S. Ramaswami Ayyar was on privilege leave from 19th November 1913 to 18th December 1913 and he remained on the farm the rest of the period.

Assistant Farm Manager V. Ratnaji Rao who joined duty on 21st August 1913 remained on the farm till the end of the year, except during a short period when he was at Sirvel in connection with the starting of the station.

Sirvel Agricultural Station.

The opening of this station was sanctioned by the Government during the year, and land comprising three blocks was acquired in March 1914. Two of the blocks were fenced in before the end of the year. Since then materials were being carted for the erection of buildings.

Staff.—Farm Manager V. G. Dhanakoti Razu joined duty on 27th March 1914 and remained in charge of the farm till the end of the year.

D. ANANDA RAO,
Assistant Director of Agriculture.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, SOUTHERN DIVISION, FOR THE YEAR 1913-14.

I have the honour to submit the administration reports of the agricultural stations under my charge.

2. I was in charge of the southern division until 23rd April and from 3rd November till the end of the year. During this interval I was in charge of the duties of the Principal of the Agricultural College and Superintendent of the Central Agricultural Station, Coimbatore. Mr. K. Ramasastrulu Nayudu acted for me during the period of my transfer from this division. With the appointment of newly passed students from the Agricultural College as officers in this department it was again rendered possible to expand our district work. Since however, the men drafted into the department were all inexperienced and only in exceptional cases were they qualified by experience to do district work, the work on our agricultural stations suffered to some extent as such men often had to be left in charge to carry on the work there.

3. Owing to changes in staff and want of experience in local conditions, practically no district work has yet been attempted in the Tanjore district since the opening of the agricultural station at Manganallur, but in the case of the other two agricultural stations in this division the district work within their sphere of usefulness has shown very great expansion.

4. The Taliparamba Agricultural Station in North Malabar although not typical of the main cultivation of the West Coast has served a very useful purpose and the following are the main lines of district work which have been taken up:—

(1) Introduction of better varieties of sugarcane.
(2) Improvements in the methods of the manufacture of jaggery.
(3) Improvements in paddy cultivation by (1) economic transplanting, (2) by green manuring.
(4) Introduction of intensive dry cultivation.

The introduction of better varieties of cane into the South Canara district commenced in 1909. Although the people at first regarded such efforts to improve their agricultural practice with grave suspicion, the superiority of the Red Mauritius cane and under certain conditions of the B. 208 cane very soon asserted itself and their cultivation was extended. Still there were many difficulties to overcome before these canes could be cultivated on a large scale. In the first place the wooden mill commonly used in the district would not crush properly these hard jackal proof canes. This meant that iron mills had to be introduced and naturally the initial cost of these, especially when it is remembered that canes are mainly cultivated by Christians who, as a whole, are not a rich community was a further obstacle in the way of the introduction. Here again the efficiency of the iron mill very soon asserted itself and now the wooden mill is very rarely to be seen. A further difficulty was the primitive methods in vogue for the manufacture of jaggery. This entailed a very heavy expenditure on fuel and practically restricted the cultivation to such parts of the district where fuel was both cheap and plentiful. The local furnace did not allow of any through ventilation and thus the fuel was only partially consumed while much of the heat was not used in heating the boiling pans. The pans also were of the wrong shape being rounded at the bottom and in parts of the district so small that they held not more than four gallons of juice.

An improved furnace with a through draught and one much more economical of fuel had to be introduced and these when once tried have rapidly ousted the old pan and furnace. Thus the work has not been merely the introduction of a new variety of cane but a complete alteration in the local practice of milling canes and preparing jaggery involving a considerable outlay of capital. Now, it is possible to make jaggery without purchasing any fuel at all. More than this it has meant a further very considerable saving of fuel as this improved furnace and boiling pan is now being erected by ryots for boiling paddy, even by ryots who have never grown nor have any intention of growing canes, simply because it is found to be so economical of fuel. This is an important consideration in this district where practically no raw rice is consumed. This year's work though it entailed the absence of two officers from the agricultural station for a considerable time after the monsoon has meant a very great deal to the district, especially in the Mangalore, Udipi and Coondapoor taluks where work has been concentrated. Hitherto South Canara has not grown enough cane for its own consumption but there is no doubt that, with the present rate of expansion of the area under this crop, it will soon be able to compete with the export trade to other districts. Preliminary work has been commenced in earnest this year in the Kasaragod taluk where it is hoped that expansion will be equally rapid.

It may be said that too much time has been spent on a crop such as sugarcane which occupies such a small proportion of the area under cultivation, but it must be remembered that cane is only grown in small areas individually, that it is a crop grown in rotation with paddy and by the introduction of these improvements it has been possible to gain the confidence of a large number of the actual cultivators of a district which at present it is possible only to help by district work. Besides what has already been noted the introduction of better canes has been accompanied by better methods of cultivation and better methods of manuring. This latter is important as it has brought into prominence the value of fish manure to the ryot as a manure for his crops.

No attempt has been made to give figures to show the increase in the area of cane as these can best be seen by the Revenue Department's figures given in the season and crop report.

For red Mauritius canes alone the Collector has kindly furnished the following figures which show the rate at which the area under this variety is increasing:—

	1913.	1914
Coondapoor taluk	29·67	67·21
Udipi do.	34·40	89·59
Karkal do.	1·75	6·00
Mangalore do.	17·85	31·00
Total ...	83·67	193·80

The following figures showing the value of these improved varieties of cane and the saving effected by the introduction of the improved furnace are of interest. These were

obtained by experimental harvesting and boiling of ryots' crops in a village of the Mangalore taluk :—

—	Area of crop experimented with.	Quantity of jaggery obtained.	Yield of jaggery per acre.	Approximate value of produce.	Cost of manufacture per acre.			Net value of the produce of an acre.
					Cost of fuel.	Cost of labour.	Total.	
1	2	3	4	5	6	7	8	9
	CENTS.	LBS.		RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
Local method with local canes (Dassa Kabbu).	10	756	13½ candies (of 560 lbs.) or 7,560 lbs.	378 0 0	59 1 0	11 8 6	70 9 6	307 7 6
Improved method with local canes.	...	...	...	378 0 0	29 8 6	3 6 0	32 14 6	345 1 6
Improved method with red Mauritius canes introduced by this department.	10	1,009	18 candies and 10 lbs. or 10,090 lbs.	504 8 0	...	4 8 1	4 8 1	499 15 11

5. Experimental trials of green manure crops are being made in the wet lands of the Mangalore taluk. I use the word experimental and not demonstrational since the local conditions in South Canara are so different to those in Malabar that what can be recommended for demonstration in the latter district does not apply to South Canara and actual experiment has to be made.

6. In Malabar in association with the District Revenue officials an effort has been made to start village agricultural societies. Twenty-two of these in all have been started and many of these have worked fairly satisfactory while a few have done good work and a few have taken little or no interest in the work. These were each given the same work to do, viz., economic planting of paddy. Each member of each society was to try this and compare the results with plots of similar fertility grown in the ordinary way. A large number of plots in the two seasons were thus planted. In most cases an equal or a higher yield was reported. The head of each village society was supposed to report results on the trials of the members of his society. These societies will again repeat the trial of this improvement next season and the area thus planted will form a better testimonial as to the value of this improvement than any amount of figures. These associations are located throughout Malabar. There are six in North Malabar, seven in the Malapuram, five in the Palghat division and the rest in Calicut taluk. A few of the better managed societies will next year have demonstration plots of green manures. It is too soon yet to say how this method of introducing agricultural improvements will succeed. Malabar is a particularly favourable district in which to commence such work, as a considerable amount of touring throughout the district has been done by the officers of the department during the last few years and the agricultural station at Taliparamba is made good use of by the farmers of the West Coast. Most of the heads of these village societies were men who were known to the officers of the department to take a keen practical interest in agricultural improvement and many of them had already themselves adopted improvements recommended to them. The supervision however of so many small societies which means at least two to three visits to each village entails much work on the part of this department and with our present staff it is as much as can be done to supervise and develop these. The spread of sugarcane in Malabar has not made much progres during the year, but in a few places where ryots have bought the necessary appliances for the milling of canes and the manufacture of jaggery, it seems to have become established.

7. In the neighbourhood of the Taliparamba Agricultural Station and following the example set there, there has been a very considerable expansion in intensive dry cultivation which, it is hoped, in time will substitute the reckless methods of punam cultivation now in vogue. Ginger and chillies in rotation with cereals are now being grown in considerable areas of dry land which formerly were not permanently occupied and it is evidently so profitable that many well-to-do persons, chiefly Muhammadans, have taken up and enclosed land for this purpose. It is unfortunate that at this juncture the price of ginger should suddenly drop to so low a price as to barely do more than cover the cost of cultivation if as much.

8. The three officers attached to the Taliparamba Agricultural Station have between them spent 406 days on tour in the South Canara and Malabar and 27 days outside these two districts.

9. Work in the neighbourhood of the Koilpatti Agricultural Station is mainly connected with the improvement of the Tinnevelly cotton crop. The financial aspect of this work will be

separately reported but as the work in this connection is so intimately connected with that of the agricultural station it will not be out of place to review it here.

The system of cultivation on the black soil of this station is very different to that in the district. For cumbu (the main cereal) and for cotton this is especially the case. On the agricultural station both these crops are invariably sown with the gorru or seed drill and afterwards the land between the rows is intercultivated with the bullock hoe. The superiority of this system of cultivation, in so far as cotton was concerned, was soon very clearly demonstrated and in 1907 with the aid of funds made available for the improvement of cotton cultivation efforts were made to introduce this practice to the ryots of the tract. In the same year with the help of the same funds seed farms were started for supplying pure Karunganni cotton seed. This crop was grown by ryots, on agreement, for the department and the kappas or seed cotton sold to the department. One of the main conditions in the agreement was that the crop should be sown with the drill. In this way it was possible to demonstrate this improvement in many centres. Gradually ryots came forward to seek assistance from the department to sow their crops with the drill and gradually the full utility of the drill was realized. It was shown, and in some cases ryots learnt for themselves, that cereals and other crops could be sown with the drill and that it was possible to sow mixtures with the cereal and even cotton if desired. In some cases the ryots have been able to teach the officers of the department. For example, this year the weather conditions did not permit of working the bullock hoe in the cumbu crop at the proper season as the land was too wet. Now even in a broad-casted crop it is essential to plough through the cumbu crop if it is to yield properly, ryots knew that they could work their wedge-shaped wooden ploughs when the land was still too wet to use the iron bullock hoe. In one village two ploughs were tied together and thus worked between the rows while in another the plough was worked across the rows, which loosened the surface soil and dried it sufficiently to work the bullock hoes along the rows. Very considerable success has been attained by sowing cumbu with the drill. With hardly an exception an increase of 25 per cent. or more of grain has been obtained and in spite of the unfavourable season higher yields than have hitherto been noted have been obtained in some villages. The following figures show the area which has been drilled in the district this year:—

——	1910–11.	1911–12.	1912–13.	1913–14.
	ACS.	ACS.	ACS.	ACS.
Cotton	1,549	2,757	2,733	5,809
Cumbu	70	818	1,040	1,308
Total ...	1,619	3,575	3,773	7,117

10. It is, however, in the cotton seed grown on the Koilpatti Agricultural Station that there has been the most improvement, until last season all the seed supplied to the seed farms was grown on the agricultural station. The crop on the agricultural station was grown with seed selected in bulk, each year sufficient plants of the type required being selected to grow an area which would supply sufficient seed to sow the whole area of the agricultural station not required for experimental selection. In this way a type of Karunganni which naturally shows considerable variation was more or less fixed—a bushy shaped plant, carry a considerable portion of its crop on boll bearing branches given off from the upper part of the main stem and the rest on boll bearing branches similarly given off from the main secondary branches. Last year one of the single plant strains was of sufficient promise to warrant its being grown on a seed farm scale. Twenty acres of this was grown and the seed obtained was sold to selected villages throughout the cotton tract from Virudupatti town to Tuticorin. In all over 300 acres were this year grown of which 100 acres were grown for seed for the department. In all parts of the tract this strain promises well. In one or two instances showers fell when the cotton was setting its bolls which greatly reduced the yields but the same mishap is liable to affect the yield of any variety. In one case the crop has been attacked by disease. In addition to this, several other strains are being grown for the department by ryots in order to render it possible to have actual spinning tests made. These are not necessarily for seed but merely to enable the department to get sufficient lint for satisfactory mill tests. The " modus operandi " is however merely a continuance of the work already in progress. As mentioned last year, one of the chief problems which had to be solved was to keep a good strain of cotton in a village where once it had become established. Last year efforts were made to get villagers to combine together and take in their kappas to the factories to be ginned. These efforts were partially successful in the case of three villages. I say partially because in two cases it was practically the work of individual ryots and in the third case, although several ryots took in their kappas it was not a joint consignment but each man had his own kappas ginned separately. Since then in two villages Agricultural Co-operative Societies have been formed with this primary object of joint sale of their cotton, while some 25-30 new villages have agreed to adopt this procedure of the joint sale of kappas in order to supply their village with good seed. It is hoped that with the development of this procedure in time the seed sold by the department will be looked upon as a necessity to maintain the quality of the seed in the

village and not merely as a source from where pure reliable seed can be obtained in unlimited quantities. Mention has been made in previous reports of the difference in the season between the north and south of the Tinnevelly tract which necessitates the introduction of an evenly ripening type of cotton in the north and the success of the single plant strain tried there this year promises a field for considerable development of our work in the future.

11. In addition to the district work carried on in the neighbourhood of the agricultural stations a considerable amount of district work has been done mainly in Madura and Coimbatore.

12. In Madura the work has been practically confined to the introduction of green manure crops which has been attended to with varying degrees of success. Some work also has been done in the introduction of the practice of single planting of paddy. This year over 1,100 bags of Kolingi (Tephrosia purpurea) seed was collected for the department to supply not only the Periyar tract but also the requirements of Tanjore, South Arcot and Chingleput. In Tanjore the distribution is confined mainly to the Shiyali taluk where the soils are lighter and do not crack so severely as in the main part of the delta. In Chingleput there is an yearly increasing demand for this seed. In Madura the demand is difficult to gauge as private enterprise has now stepped in to supply the seed. Moreover in some villages the crop has become so far established that it seeds itself. Difficulty was again experienced in obtaining daincha seed. Attempts which in the beginning were very promising were made to grow this on the deep red soils near the foot of the ghauts in the Rāmnād district, but as the season failed completely this crop failed too and practically no seed was obtained. The supply from Bengal which was ordered in two consignments, one at the beginning of December and the other on 31st January 1914, did not reach here until April. This was exceedingly unfortunate as the season when the seed is chiefly required is in March. The season and water-supply also were not favourable to this work in the Periyar tract, the hot weather rains were very scanty and it is on these that the green manure crop has to depend for its growth. The chief difficulty however has been in getting the seed to germinate. If sown before harvest the fields are often too dry to allow the seed to germinate and if sown after harvest the channels are usually dry as well as the soil. At the time of puddling also the supply is insufficient to keep the fields wet enough to properly rot the green manure crop before transplanting. Several persons who bought seed were unable to sow and the several who sowed were disappointed at the non-germination of the seed. In spite, however, of these difficulties the area successfully grown with green manure crops is estimated at about 1,700 acres.

13. An officer of this department has been placed in charge of district work in the Coimbatore district. Until 3rd February 1914, he was working under the Principal, Agricultural College, and since then he has been under my charge. The main lines of work which have been undertaken are:—the introduction of single planting of paddy, the introduction of green manure crops and the introduction of the use of fish manure. His work, therefore, was practically confined to wet and garden land. All these lines of work have met with considerable success. Unfortunately, however, this officer's services were required for conducting crop cutting experiments at a time when he should have been visiting villages where fish manure had been sold. Though many ryots did follow the instructions given for the use of this manure and proved the value of this as supplementary manure to the local supply, others either used it too lavishly with the result that they spoilt their crops or did not use it at all. In spite, however, of these failures by those who did not follow instructions or did not use the manure, there is an increasing demand for this manure and it is unfortunate at this juncture that the catch of sardines on the West Coast should have failed.

This is the first time that an officer has been placed in charge of more or less general district work and the success already achieved warrants an expansion in this direction of work.

14. In January of this year a central division was formed which relieved me of one agricultural station and of three districts. In spite of this, however, there has not, with the expansion in other directions, been any appreciable relief. One thousand eight hundred and forty three letters have this year been received from private individuals, asking for advice, etc.

Koilpatti Agricultural Station.

The season.—The summer rains which are required for the summer or second flush of cotton, though not considerable in quantity, were opportune. Out of a total fall of 4·63 inches in April-May 3·40 fell on one day thus thoroughly moistening the soil and enabling the crop to make full use of it.

The general sowing rains were very late. The highest daily fall in September, during which month the crops on the red soil are sown, was only ·76 inch out of a total of 1·54 on five days. With the aid of this the dry crops here were sown but a prolonged spell of dry weather following did much damage to the crops on this shallow soil. The sowings on the black soil were very late indeed. No rain fell in sufficient quantity to sow until the 20th October and the land was just getting dry enough to work after this when rain again started. This came mainly in light showers accompanied by continuous cloudy weather so that it was not until well into

November that the sowing of cotton could really commence. Showery weather continued until the third week in December which greatly hindered weeding operations, besides checking the growth of the young crops, which after so much damp required bright warm days to give them a fair start. In many places in the neighbourhood ryots were not even able to inter-cultivate their cumbu crop, an operation which is recognised to be essential to its good growth, while Rs. 3—4 per acre were common acre rates to be paid for hand-weeding. The results of these adverse weather conditions were that the cumbu yielded a poor crop, pulses, except for Bengalgram gave practically no yield and cotton was still young when the hot weather set in and could not properly set its crop. On the whole the season has not been a good one but it was considerably better than the tract immediately north of this where rains were very scanty indeed. The total annual rainfall was 28·24 inches against an average for the last six years of 29·98 inches.

Black-cotton soil work.—The work of improvement of the local Karunganni cotton by selection has been continued. The following is a report on the Karungauni seed of which is now being sold to ryots and on a single plant strain put out last year, of the spinning tests made by the Ambasamudram Mills :—

Report, dated 28th August 1913.—" In reference to your request for a test of the pure Karunganni cotton received from Sattur we beg to state as follows :—

" The cotton in the bales is very clean and exceedingly free from broken leaf and stained dead fibres. The two tests taken through the blow room gave a loss of 7½ to 7 per cent. respectively. The fibres seem very even and although perhaps of a rather more creamy colour than Tinnevelly cotton, the cotton has a silky appearance which makes it look quite white. We took it through to the ring frame and spun it along with our ordinary 20s. The result was for the same counts an average strength of 58 lbs. against our ordinary 20s. of 50 lbs. The yarn is very even, very clean and is an exceedingly good 20s. yarn. Comparing the tests with past tests of Tinnevelly and Cambodia, the Karunganni seems to just come between the two in point of strength, but is superior to both in other respects."

Report, dated 4th October 1913 (*on specially selected Karunganni*).—" It was very clean in the bale and the test of 100 lbs. from each bale showed a loss of 6 to 6·5 per cent. respectively. This was rather better than the test taken of the same name of cotton in August.

The carding showed it to be particularly free from nep and leaf. We spun it into 20s. yarn and the spinning was excellent. The resultant yarn when tested for strength gave as follows :—76, 57, 58, 58, 60, 60, 83, 61 average strength 65 lbs. When tested for evenness it showed us a splendid even yarn of which we herewith enclose you a head for your inspection.

Taking the test made in comparison with the test made in August we have no hesitation in saying that the cotton is much superior in evenness of staple and slightly stronger, but the colour of the two are identical. It is nice silky cotton and although of a slightly creamy tint, the yarn looks very white and is a very satisfactory yarn in every way."

Three hundred and fifteen acres have been sown with this seed this year, of which 105 acres are seed farm for the department. This has also been tried in the north of the Tinnevelly tract and promises to suit the seasonal conditions here, thus extending our sphere of district work to a part of the tract which heretofore we have not been able to touch. Six single plant strains which last year had reached a field scale, as well as the one previously put out, were grown on ryots' lands under seed farm conditions on areas of 20 acres of each, the object being to get sufficient lint to have a thorough test made of its value for spinning. It was decided that a valuation made on this basis was essential as valuations of lint and kappas based on mere examination of hand samples of the lint are so contradictory as to be practically useless. Four single plant strains which last year were grown on 5-cent plots are this year being grown on a field scale on the agricultural station itself, while 14 further selections are now being grown on 5-cent. field plots. The single plant selections sown this year have not fared well. Unfortunately heavy rain followed immediately after the sowing was completed and the whole series had to be resown ; thus it was not until the second half of November that these were sown. The result has been that the crops are very backward and will not now have time to fully develop.

The Periamanjal cholam introduced from Coimbatore has again done very well as a fodder crop but unfortunately it has not been possible yet to get this to set its seed ; and seed, if it is to be grown, has to be imported from Coimbatore.

Red soil work.—Here the bulk of the crops suffered severely not only from the dry weather which followed the sowing but from the continuous rain which followed this short drought and which prevented any weeding being done. The onion crop failed almost entirely not only on the agricultural station but throughout the tract.

The installation of the cotton gin and the oil engine to work it, was completed early in the year and all our seed farm kappas which formerly was ginned by hand was this year ginned by this double roller gin. An additional and improved pattern gin was procured through Messrs. A. F. Harvey & Co., and will also be utilised this coming season. Considerable advice and assistance have been given to two Agricultural Co-operative Societies which have been started in the neighbourhood of this agricultural station but it is too soon yet to state how these will work.

Staff.—The agricultural station was in charge of Farm Manager M.R.Ry. A. V. Tirumuruganatham Pillai until 21st May 1913 when he was transferred to the Central Farm, Coimbatore. Since then it has been in charge of Farm Manager M.R.Ry. N. S. Kolandaiswami Pillai; Assistant Farm Manager K. P. Sundara Ayyar, who was working on the agricultural station until 14th June 1913, was put on to district work on relieving Farm Manager M.R.Ry. V. G. Dhanakoti Raju who was on leave from 15th June 1913 and on expiry was transferred to the Palur Agricultural Station. Assistant Farm Manager A. Chinnathambi Pillai was appointed to this department on 28th January 1913 and was working on this station until 29th August 1913, when he was put in charge of district work in place of Farm Manager M.R.Ry. Kolandaiswami Pillai. Acting Farm Manager M.R.Ry. K. Ramanatha Ayyar was transferred from the agricultural station on 1st March 1913 and put on to district work in Madura district for the introduction of green manure crops under the Periyar irrigation system. Assistant Farm Manager T. A. Krishna Ayyar was stationed here from 10th January 1913 and his work was divided between the agricultural station and district work in Madura district for the introduction of green manure crops. Assistant Farm Manager M. Raman was transferred to here from the Cane-breeding station, Coimbatore, on 26th July 1913.

One pair of cattle were bought to replace an old pair which were sold.

Manganallur Agricultural Station.

Season.—Owing to the late freshes in the Cauvery the first crop paddy was considerably delayed in being planted. The result was that the crops ripened during the heavy rains of September and October and were somewhat damaged thereby. The second crop owing to the lateness of the first crop was also very late in being planted. It was submerged on several occasions before it became fully established and in consequence was much damaged and checked in growth. Later the supply in the channels failed when the crops were in short blade. The crops on the single crop lands greatly benefited by the season; the rains arrived when the crop was fully established and it was thus enabled to benefit considerably thereby.

Crops.—The yield of paddy on double crop lands was for the reasons stated above considerably below expectations. On the single crop lands the yields were good and very much above the average for these lands and considerably better to those obtained from similar land adjoining the agricultural station. The reasons for this were:—the favourable season, the crop was enabled this year to benefit from the green manure grown and ploughed in the previous season, fields not required for definite experimental plots were manured with fish manure at 3 cwt. per acre, the area under heavier cropping varieties was increased.

Considerable attention has this year been paid to seed selection. All varieties grown on the agricultural station were found to be badly mixed. This was more especially the case with the Red Samba and Nellore Samba varieties and special attention has been taken to select sufficient seed apparently true to variety of all varieties for sowing the farm next season. In addition to this single plant selections were made of the principal varieties. Several series of experiments were started this year, viz.—

To find out the best way to apply green manure crops to heavy delta soils.

To see how far the apparent deficiency of lime in the soil affects the crop yield.

To test the availability of phosphorus in phosphatic manures when applied to swamp paddy soils.

To test by crop yields the manurial requirements of the paddy crop on heavy delta soils.

In laying out these, however, insufficient attention was paid to the elimination of avoidable factors which would cause experimental error and a fresh series of plots will have to be laid out. It was, however, abundantly evident that soluble phosphates such as super-phosphate gives immediate returns in the shape of increased yields and it was also evident that potassic manures are not required nearly to the same extent as phosphatic manures, if indeed they are required at all.

Harvesting operations occupied a much longer time than was expected especially as all fields intended for experimental work were divided up into 5 cent plots for harvest. The local harvesting methods are very extravagant of labour much more so than has been experienced in any other district. All the grain cut in the morning has to be carried, threshed and winnowed the same day and all the labour employed in cutting has to help with the carrying and threshing, etc. In the case of several fields the crop was cut, bundled and stacked in the grain somewhat after the methods employed in the Northern Circars and the threshing of this is not yet completed. Attempts also were made to cut the crop with a reaping machine. This is quite feasible in the case of poor crops which are not laid but owing to the weakness of ripe paddy straw it is impossible in the case of heavy crops which are badly laid; at any rate, if these are allowed to become dead ripe in the field.

Insect pests and diseases.—A certain amount of damage was caused to the paddy seed beds by thrips, but these after a rain soon disappeared. Another serious pest made its appearance after the crops had been drained for harvest. This was a caterpillar of nocturnal habits which bit off the branches of the pannicle thus shedding the grain on the ground. The pest was purely local and only occurred in certain parts of the farm but where it was evident it is no exaggeration to say that more than one-fourths of the yield was lost. The Government Entomologist is

investigating the life history of the pest. A similar pest has been reported from other parts of the delta. Green smut also was very bad in some fields especially in those which came into ear before the north-east monsoon rain had ceased. The attack was most severe on the finer white grained varieties such as white Sirumani and Molagu Samba.

Buildings, etc.—Two irrigation wells are being constructed in the dry area. One is intended for the irrigation of cocoanuts which with the attention given to them have very considerably improved and the other for raising fodder and garden crops. These could not be completed during the year owing to the lateness of the north-east monsoon rains which prevented the water level from sinking sufficiently low for excavation.

The farm is now beginning to attract visitors and several applications have already been received for seed and manure. The former, however, cannot be complied with yet until our varieties are grown pure nor can the latter, which are mainly for fish manure, on account of the scarcity of this product on the West Coast.

Staff.—Farm Manager M.R.Ry. K. Sankara Ayyar was in charge of this Agricultural station until 3rd December 1913, when he went on leave. Farm Manager M.R.Ry. T. R. Venkaswami Rao has been in charge since that date. Assistant Farm Manager K. Raghava Chari and Assistant Farm Manager K. Ramanuja Chari were posted to this Agricultural Station on 20th June 1913 and 31st August 1913, respectively, and have remained there during the remainder of the year under report.

Taliparamba Agricultural Station.

Season.—The hot weather rains were light but well distributed but inasmuch as these were very local the Agricultural Station fared much better than many parts of North Malabar. These culminated in very heavy thunder storms just before the south-west monsoon burst. The south-west monsoon was very light; it commenced very well but rains were very light in the latter part of June as also in August and September. This, though favourable to the pepper crop, caused considerable scarcity of water at the planting season for the first crop of paddy and the latter crops were rather lighter than usual. The pepper crop, however, gave the highest yield yet recorded on the Agricultural Station. The north-east monsoon rains were, on the whole, favourable though rather too concentrated during the cyclonic disturbance in the second week of October. These materially assisted in maturing the crops of ginger, turmeric and chillies on the dry land. The rains ceased in October and from November till the end of March, dry weather continued. The rainfall recorded was only 116·55 inches against an average for the last eight years of 141·98 the shortage was mainly during the south-west monsoon when only 83·24 inches were recorded against an average of 117·925 inches.

Wet lands.—Of the cane varieties under trial, besides the Red Mauritius and B. 208 which have already been distributed in the district, B. 147 and a sport from Red Mauritius both seem promising and have been planted on a large scale for the next season. Several varieties have also been planted for the Government sugarcane expert.

No experiments were done with the paddy crop which occupied two acres. The yields were not as good as those obtained last year since the season was not as favourable. The seed will all be kept for distribution. Very favourable reports have been received regarding the superiority of the seed grown here and the whole of last year's crop was sold at an enhanced rate, which shows that ryots are anxious to obtain our seed.

Pepper gardens.—The yield obtained this season is higher than any previously recorded. This is partly due to the season and partly to the growth of young vines planted since this farm was established. These latter have this year yielded about one-sixth of the total crop obtained. The lime and leaf mould plot referred to in last year's report has again given an advanced yield of 217·75 Madras measures. No further remarks seem called for as those made last year still apply.

Dry land crops.—There has been little fresh work done here beyond testing of varieties of ragi and chillies. The system of intensive dry farming as demonstrated on the Agricultural Station shows considerable expansion in the neighbourhood. Ginger cultivation will probably receive a check owing to the very low prices which now obtain. At these prices the crop leaves little, if any, profit in itself. Since however very high yields of dry paddy have been obtained when this has been grown after Ginger in the rotation this may still stimulate this cultivation. One cultivator is reported to have obtained over 600 Madras measures of paddy per acre when cropped after ginger which is an unprecedented yield for hill paddy in North Malabar. A few varieties of American Cowpeas were tried. These proved very successful and were much earlier than local varieties. This should prove useful as it supplies fresh vegetables during the monsoon when these are scarce.

Staff.—This has remained unaltered during the year and consists of one first-grade Farm Manager, one 2nd-grade Farm Manager and one Assistant Farm Manager. A very considerable expansion in district work has been possible since the staff has been augmented and this has been greatly assisted by the interest which the Collectors of South Canara and of Malabar take in the work of this department.

H. C. SAMPSON,
Deputy Director of Agriculture, Southern Division.

4th May 1914.

Administration Report of the Extra Deputy Director of Agriculture, Central Division, for the year 1913-14.

I have the honour to submit the Administration Report of the Agricultural Station and the District work under my charge.

2. The Central Divison was formed from the 1st of January 1914 by separating some of the districts from the charge of the Deputy Director of Agriculture, Southern Division, and that of the Deputy Director of the Northern Division. It comprises at present of the following four districts with one Agricultural Experimental Station at Palur near Nellikuppam Railway Station in the South Indian Railway :—

(1) South Arcot district.
(2) North Arcot district.
(3) Chittoor district.
(4) Chingleput district.

3. I took over the charge of the Palur Agricultural Station from Mr. H. C. Sampson, Deputy Director of Agriculture, Southern Division, on the 7th January 1914, from which time I have remained in charge until the end of the period under report, except for a period of ten days from the 15th to 24th March 1914, when Mr. Roger Thomas, Supernumerary Agriculturist, acted for me during my absence on casual leave.

I was able to spend about 87 days on tour during the year and, besides visiting Koilpatti Agricultural Station, was able to make inspection tours in the South Arcot, Chingleput and Chittoor Districts to acquaint myself with the local agriculture and the improvements introduced.

4. The work of extending the single seed transplantation of paddy and green-manuring wetlands was pushed in the division by holding various meetings and demonstrations on the ryots' lands where these methods of improving the local agriculture had proved successful. Attempts were also made to organise Co-operative Agricultural Societies in various compact groups of villages for the improvement of the staple paddy crop; as for instance at Tiruvengaranai and the neighbouring villages in the Conjeeveram taluk of the Chingleput district. Meetings of the existing Agricultural Associations of the various places, as for instance at Cuddalore, Chidambaram, Vriddhachalam, etc., were also addressed in this connection. The District Agricultural Association of the South Arcot district held in a meeting at my instance at Cuddalore on the 4th April 1914 under the presidency of the Collector of the district, passed a resolution requesting the co-operation of the various village officers of the Revenue Department for the spread of the single seedling system of transplanting paddy, and growing various green-manure crops in wetlands as advocated by the Agricultural Department.

5. It is hoped that, with the co-operation of these village officers in different districts, it would be possible to estimate every year the spread of various improvements in local agriculture of the different villages, pretty correctly.

6. I can, however, say with confidence that the system of transplanting paddy singly, and growing green-manure crops on wetlands, have penetrated considerably into the interior of the various districts of this division with great benefit to the ryots who have adopted these improvements. It is not possible to give exactly the extent to which these improvements have spread, not having systematically measured the area under them in every village.

7. It may not be, however, out of place here to mention that 5,957 lbs. of improved seed-paddy sufficient to transplant 397 acres under single seedling were distributed from the Palur Agricultural Station during the year 1913-14; while the total quantity of various green-manure seeds distributed from the two seed depots in the Division ran to 65,898 lbs. which would suffice to sow 3,746 acres of wet lands.

8. The general demand of green-manure seeds, especially those of wild indigo, has this year been much greater than could be supplied and arrangements are being made for a very large increase of the supply of this seed for next year. The Chingleput district alone have absorbed 32,453 lbs. of this seed, while the South Arcot stands next with 10,450 lbs.

9. The season this year was very late and abnormally wet in the latter part of the year in the South Arcot district. The total rainfall received was nearly double of that of the average for the last seven years. This brought about enormously heavy floods in the local rivers passing through the tract, causing damage to the various standing crops, livestocks, buildings, etc., of the unfortunate agriculturists of the district.

10. Special efforts were made by the department to secure from the Tinnevelly side the seed of some of the late season short duration varieties of paddy called 'Chitrakali' and 'Kuruvai' for resowing the wetlands in the Chidambaram Division, where the harm done by the floods to the various standing paddy crops was excessive.

11. In all 7,810 lbs. of seed paddy were obtained through the Superintendent, Sivagiri Home Farm, and both the varieties were distributed to the various ryots through the Tahsildar and the Revenue Divisional Officer of Chidambaram. The germination of the seed

of both the varieties was quite successful and a good stand was obtained in almost all the villages where this crop was raised; but during the later part of the season the crop suffered in most villages for want of sufficient irrigation water, as most of the irrigation tanks were breached during the recent so very disastrous floods.

12. Both the newly introduced varieties were grown at the Palur Agricultural Station and the 'Kuruvai' has been found to have done better than the 'Chitrakali.' They will be tried again next year and efforts will be made to acclimatise them to the tract for preserving the seed in future to meet similar disasters.

13. Various improved implements were made and distributed from the Palur Agricultural Station. The details in connection with this will be found in the administration report of the Palur Agricultural Station.

The Palur Agricultural Station.

Season.—The rainfall for the year has been 83·49 inches, nearly twice as much as the average for the last seven years. Again the distribution was very bad as seen from the following figures :—

Month.	1913 inches.	Average of preceding seven years, inches.
April and May	1·50	1·70
June and July	1·59	4·78
August and September	15·57	10·40
October, November and December	64·07	25·01

A well distributed rainfall from June to December in both the monsoons is the necessity of this tract. Yet over 54 inches were recorded during the months of November and December only; while only a little over 3 inches were received up to the middle of August, delaying the sowing of the rainfed cereals for an abnormally long time. The hot weather irrigated crops received practically no help from the South-West Monsoon rains, but owing to the erection of two single mhotes during the year in the garden land area of the station it was possible to raise a good crop of irrigated groundnuts. The rainfed cereals and groundnuts having been sown very late in the season suffered enormously from the excessive downpours of the North-East Monsoon in October and November.

Nearly similar was the fate of the late season or samba paddies. The young crops of these varieties were totally submerged under water for a number of days and the proper drainage of the various plots of paddy was made practically impossible.

The first crop paddies were on the other hand a bit benefited by the late South-West Monsoon rains. The sugarcane was not, however, much damaged by the late heavy showers in November and December owing to its having been planted rather early in the season and on a comparatively higher plot. The long spell of drought in the hot weather caused a great deal of difficulty in sufficiently irrigating the sugarcane plots.

Rainfed crops.—Owing to the erratic nature of the season as above mentioned these crops were sown very late, and later in the season they were considerably damaged by the enormously heavy downpours of the North-East Monsoon. Little reliance can therefore be placed on the results of this year.

Irrigated crops on garden land.—Special facility of irrigation afforded by the two newly erected single mhotes in this area made it feasible to raise very good crops of irrigated groundnuts although they were not much benefited by the hot weather rains of the South-West Monsoon. Many of the newly introduced varieties seem to have become acclimatised. Madagascar has given the highest average yield for the last five years with a good percentage of oil in the nuts. The variety from Senegal, and West African also compare very favourably with the local Mauritius, the popular variety.

Crops on wetland.—The sugarcane has given good outturn this year, having been planted rather early in the season and situated on a comparatively high level plot, which allowed facility for drainage. Barbadoes seedling No. 147, a thick tall cane of rather erect habit, has given the highest yield per acre with a fairly high percentage of sucrose and co-efficient of purity in the juice. Red Mauritius, the variety which has proved so successful in this tract, is very near it. Tana Blanche, a large thick cane, capable of standing up well seems to be improving. It has given a fair yield per acre and has much improved in its percentage of sucrose. Java seedling No. 247, a thin cane of good erect habit, has stood third as regards yield per acre with good analytical results. Barbadoes seedling Nos. 1529 and 208 show excellent analysis but have yielded poorly. The other varieties grown at the station have been either liable of being much lodged or damaged by jackals although capable of giving high yields with good analytical results.

First crop paddy crops were benefited by the late south-west monsoon rains and have given very good outturn per acre. The average yield obtained this year is 1,901 lbs. as

compared to an average of 1,874 lbs. for the preceding five years. Most of the varieties grown as first season crop are unsuited to the tract as much as they do not mature sufficiently early to permit of planting the second crop in proper season. Two of the newly introduced varieties called "Chinckapore" and "Safeda" have ripened this year much earlier than before and have given better yields per acre. It is interesting to note that the ripening period of Sambalpur variety decreased to 126 days from 158 days the average for the last four years by sowing the nursery rather late in the season.

The samba crop paddy was damaged to some extent by the excessive rains of the north-east monsoon in November and December and the yield per acre is in consequence generally low this year. The average yield per acre obtained this year is 2,128 lbs. per acre against an average for the preceding four years of 1,965 lbs. The total yield this year for both crops on the Agricultural station is 33,518 lbs. against last year's figure of 38,719 lbs. and that of 1907-08, 21,852 lbs. which shows the increased fertility of the paddy fields on the farm due to the practice of growing green-manure crops, for ploughing in the land.

The results obtained so far from the experiment of supplementing the green-manure with various artificials show that the land does not need supplementing the green-manure ploughed in the soil with any special plantfood, which seems to confirm the conclusion drawn last year that the value of a green-manure crop is very largely due to its mechanical action.

Seed-distribution.—The total quantity of seed distributed from the farm during the year is as follows:—

	LBS.
Paddy varieties	5,280
Other cereals	529
Groundnuts	4,194
Cane setts	4,000

Green-manure seeds.

	LBS.	
Sunnhemp	6,425·6	sufficient to sow 214 acres at 30 lbs.
Daincha	4,507·0	sufficient to sow 451 acres at 10 lbs.
Kolingi	46,604·0	sufficient to sow 2,741 acres at 17 lbs.

Implements.—The following implements were made and sold from the farm to the various agriculturists during the year under report:—

Scind ploughs	27
Triangular harrows	13
Improved country ploughs	2

Staff.—The Farm Manager of the Palur Agricultural Station continued in charge of the station throughout the period under report. Assistant Farm Manager Mr. S. Narayanayya was transferred from the Palur Agricultural Station to the Central Farm, Coimbatore, on the 22nd January 1914, and the work at the station had to be managed somehow with the help of only one assistant to the Farm Manager, with an occasional indent on the services of the special Farm Manager, Chittoor, who was ordered to go to Palur whenever he could be spared from the work in the Chittoor district. Additional work in connection with the crop-cutting experiment in the South Arcot and Chingleput districts taxed the subordinate staff considerably, and made it necessary to restrict the district work to a great extent. Farm Manager M.R.Ry. V. G. Danakoti Raju was transferred from the Palur Agricultural Station on the 22nd March 1914 to take charge of the newly started Sirvel Agricultural Station in the Northern Division having been relieved by Mr. C. V. Seshachari of the Central Farm, Coimbatore, who joined the station as an Assistant Farm Manager on the same date.

The Manager spent 162 days and the assistants 74 days in touring during the year. The Manager toured in the Villupuram, Cuddalore and Tindivanam taluks of the South Arcot district and the Tiruvallūr taluk of the Chingleput for the introduction of green-manure crops and extending the system of single-seedling transplanting of paddy. He also toured in the flood-affected area of the Chidambaram and Vriddhachalam taluks of the South Arcot district for the distribution of the late season short duration varieties of paddy obtained from the Tinnevelly side. Various villages in the different taluks of the South Arcot and Chingleput districts were also visited by him for conducting the different crop-cutting experiments of paddy, ragi and groundnuts.

Visitors.—The total number of visitors to the Palur Agricultural Station was 369 during the year.

District work in the Chittoor district, 1913–14.

The District work in this tract was started the year before last with the immediate object of introducing the practice of growing and ploughing in the various green-manuring crops in the wet lands. The Special Farm Manager appointed for this purpose spent the first year in studying the local agriculture of the district and getting acquainted with the various influential agriculturists of the different villages who would take up the improvements suggested by him.

Beyond distributing the seed of various green-manuring crops from the seed depot opened at Chittoor, attempts were made during the year under report to introduce in some villages the system of transplanting paddy singly. Owing to, however, an abnormally dry season this year the work of introducing and extending the adoption of these improved methods of wet land cultivation was handicapped to a considerable extent. This is seen from the following figures in inches of the rainfall in Chittoor :—

Year.	Chittoor district.	Chittoor taluk.	Chandragiri taluk.	Madanapalle taluk.	Vayalpad taluk.
	IN.	IN.	IN.	IN.	IN.
1913	25·53	14·65	26·38	15·24	18·96
1912	34·92	49·27	37·84	30·40	33·48
Average of last twenty years ...	32·81	36·60	32·1	27·75	27·38

Most of the ryots, who had bought the seed during the beginning of the year for sowing a green-manuring crop, have been obliged to store it having been not able to sow it on account of want of sufficient rainfall. Some of them who sowed sunnhemp, etc., early in the season were obliged to let it dry up owing to the impossibility of growing paddy without sufficient rains.

The following statement shows the quantity of the seed of the various green-manuring crops distributed during the year from the Chittoor depot :—

Number of villages in which the seed was distributed.	Sunnhemp.	Wild indigo.	Bengal daincha.	Indigo.	Total.
	LBS.	LBS.	LBS.	LBS.	LBS.
74	7,492	9,393	3,167	654	20,706

The following is the Financial Statement of the green-manure seeds distributed during the year 1913-14 :—

	RS.	A.	P.
Sale-proceeds of green-manure seeds	1,225	3	6
Do. Cambodia cotton	19	0	0

* * * * *

Besides the green-manure seed about 288 lbs. of Cambodia cotton seed were also distributed in 42 different villages of the district but the exceptionally dry season dissuaded most of the ryots from growing the crop. It has been however successfully grown in two of the villages of the Tirutani division, viz., Vadiangadu and Punimangadu.

Staff.—The special Farm Manager M.R.Ry. V. S. Narayanaswami Ayyar was in charge of the district work throughout the year except for five weeks from the 22nd September to 26th October 1913 when he was granted privilege leave.

He toured for about 276 days during the year in connection with the above-mentioned work as well as the inspection of the estates of various mirasidars and landowners of the tract. His services were also indented upon for work at the Palur Farm and in the South Arcot and Chingleput districts in connection with the various crop-cutting experiments whenever he could be spared from work in the Chittoor district owing to the shortness of the staff at the Palur station from February onwards.

G. D. MEHTA,
Extra Deputy Director of Agriculture,
Central Division.

APPENDIX III.

ADMINISTRATION REPORT OF THE GOVERNMENT AGRICULTURAL CHEMIST FOR 1913–14.

I have the honour to submit herewith my report for the year ending March 31st, 1914.

2. The Government Agricultural Chemist was in charge of the office during the whole of the year, but the following members of the staff were granted privilege leave :—M.R.Ry. R. Ramaswami Sivan, B.A., 1½ months, M.R.Ry. P. A. Raghunathaswami Ayyangar, 2 months, M.R.Ry. T. Lakshmana Rao, B.A., 22 days, M.R.Ry. B. Viswanath, 19 days and K. S. Subrahmanya Ayyar, one month and 22 days.

3. There are no changes in the personnel of the staff to report. The Chief Assistant continued in general charge of the teaching section, and M.R.Ry. P. A. Subrahmanya Ayyar of the Physics section as well as acting as the personal assistant for research work. M.R.Ry. T. Lakshmana Rao continued to act for M.R.Ry. K. Krishnamurti Rao.

4. During the year the following samples were analysed and reported upon—

	No.
Soils and silts	119
Manures	47
Foodstuffs and fodders	33
Sugarcane and sugarcane products	525
Water	42
Dairy products	2,015
Oil-seeds	62
Miscellaneous	10
Total	2,853

This is an increase of 1,494 samples over those done last year and is mainly due to work in connection with the dairy, which will be referred to in a later paragraph. There is also a large increase in the number of sugarcanes analysed owing to the development of the work of Dr. C. A. Barber, Sugarcane Expert. The increase, however, only represents a comparatively small number of the analyses which have yet to be done and which will make great demands on the energies of my staff during the following year. The work in connection with the Tanjore soil survey was finished towards the middle of the year and this accounts for the decrease in the number of soils analysed.

The number of extra-departmental samples analysed was 134 of which 66 were done on behalf of the cultivators and landowners of this Presidency.

5. The results obtained from the investigations into the conditions of paddy soils were published as a departmental memoir in October last. The subjects covered were (*a*) the variations in the composition of the soil gases proper and their bearing on the anaerobic conditions of the soil, (*b*) the composition and source of the gases evolved at the surface of paddy soils and their relation to the æration of the roots of the crop, (*c*) the effect of drainage in promoting root development and improved cropping, and (*d*) the effect of green manuring in increasing the æration of the roots.

6. The last subject (*d*) has been studied in greater detail since, and it is now possible to demonstrate that the organized film in contact with the surface of paddy soils possesses the power of oxidizing the Marsh gas and Hydrogen of the soil gases proper, to Carbon-dioxide and water respectively, and the carbon-dioxide is then decomposed with the liberation of pure oxygen. Thus the gases produced by the decomposition of green manure are utilized so as to lead to a greater accumulation of gaseous Oxygen at the surface and so bring about an increased æration of the roots. The organisms bringing about these changes have also been studied and it is hoped to publish the results shortly.

7. Experiments in sand culture were also instituted to discover, if possible, the source of the nitrogen present as a gas in paddy soils. The results obtained clearly showed that under the conditions of the experiment, the crop causes a large accumulation of the gas and that this is increased still further under the action of green manures. It was, however, found impossible to determine from the results obtained whether this nitrogen was derived from the manure or from the air. The subject is being further studied.

8. The bacteriological investigations have been chiefly concerned with the carbon cycle of paddy soils.

9. The soil survey of the Tanjore delta was completed during the year and the results are to be published as a departmental bulletin.

The proposed survey of the irrigated lands of the Guntūr district has been commenced.

10. Over 100 analyses of the common foodstuffs and fodders of this Presidency have now been obtained and it is hoped to publish them shortly as a departmental bulletin of a preliminary character.

11. Daily analyses have been made of the milk of a number of cows and buffaloes throughout the milking period in order to obtain a knowledge of the variation in quality. This series has only just been completed but the results will shortly be tabulated and communicated.

12. A study of the "Coliform" bacteria found in diseased cocoanut palms has been undertaken.

13 During the year the Government Agricultural Chemist, as a member of the committee appointed by Government to consider the Madras Sewage Farm, visited the farm several times and carried out several series of analyses. He also did work in connection with Baron Schrotky's Indigo Paste project.

14. The Government Agricultural Chemist was on tour for 73 days and members of his staff for 110.

COIMBATORE,
22*nd April* 1914.

W. H. HARRISON,
Government Agricultural Chemist.

APPENDIX IV.

ANNUAL REPORT OF THE GOVERNMENT ECONOMIC BOTANIST FOR 1913-14.

I have the honour to submit my annual report for the year 1913-14.

Staff.—M.R.Ry. K. Rangachariyar continued to act as Government Botanist till I took over charge on 13th May 1913. He was appointed as Government Lecturing Botanist on 6th June 1913 and part of the staff was assigned to his section. The readjustment of the existing staff between the two sections and the appointment of several new officers was sanctioned in G.O. Mis. No. 224 of 22nd January 1914, giving the following establishment in this section :—

Two assistants.	Two clerks.
One artist.	One store-keeper.
Two fieldmen.	Four peons.
Two plant collectors.	

With the exception of the new Assistant's post, which is not yet filled, the full establishment was in working order during the latter part of the year.

Tour.—The Acting Government Botanist was on tour for 16 days in the neighbourhood of Samalkota.

I was on tour for 78 days and visited all the Government farms with a view to becoming familiar with the crops of the Presidency. Special attention was paid to the most important paddy and cotton tracts, since these two crops will receive most attention.

A very considerable amount of touring will be necessary for me to get familiar with the agricultural conditions in different parts of the Presidency. The variation is enormous and it will be some time before sufficient information is available for deciding the exact course to be pursued. Meanwhile, the essential preliminary work has been started as described below.

The Assistant spent 33 days on tour with me on the West coast, the ceded districts, Tanjore and Chingleput.

The two fieldmen spent 25 days on tour in various places.

Research work.—It was decided that this should consist mainly of crop improvement by means of plant breeding as the most direct method of obtaining results of immediate economic value. Paddy was chosen as the main crop on which to work and, although other crops will receive some attention, none will be allowed to seriously interfere with this main crop.

Paddy.—Preliminary investigations have been started and a good deal of information already obtained on points of importance.

(*a*) Pollination as observed at Coimbatore and Samalkota does not occur in quite the same manner as that described by Mr. Hector for Bengal and crossing is likely to be more common. Many suspected crosses have been found, and material to demonstrate the amount of natural crossing has been obtained and will be sown next season. A number of methods of selfing were tried and a very satisfactory system adopted by which as much seed is set by selfing as on a normal plant naturally.

(*b*) The variation between varieties and inside one variety has been studied and selfed seed has been obtained from the main variations of a large number of varieties in order to study the inheritance of the characters involved.

(*c*) Harvesting of even plots in small lines has been carried out in order to determine the probable error in estimating the yield of plots of different sizes and shapes. The results, though they have not yet been completely worked out, show that a difference of 5 per cent. between two strains can be demonstrated with sufficient certainty by growing the progeny of a single good plant of each. This means that in selection for yield one generation will be sufficient to determine the majority of strains to be rejected. The rapid rejection of undesirables is of the utmost importance since it increases the amount of material that can be dealt with and reduces the time required to obtain results. As far as possible all comparisons for yield will be made under standard conditions for which the probable error has been ascertained experimentally.

(*d*) As mentioned above the agricultural conditions of paddy cultivation in different parts of the Presidency vary enormously. Each tract has special varieties that suit it and very commonly these will not do well anywhere else. It follows that in the production of improved strains special work must be done for special tracts and moreover much of the work must be done in the tract for which it is intended. There will be, however, always a considerable amount of work to be done at Coimbatore. There is little of the farm wet land that is suitable for this kind of work and what there is is not available since it is occupied by other experiments. It would be advisable to take up a suitable piece of land from outside and a survey of the land in the neighbourhood has been made with that end in view. Proposals will be submitted on this point in due course.

Cotton.—This will be one of the subsidiary crops investigated and material has been collected and selfed seed obtained from all the important varieties of the Presidency. A number of crosses have been made between Cambodia and Spence and Bourbon in order to follow up a line which appeared promising when Dr. Barber was working on cotton.

A system of selfing has been adopted in collaboration with Mr. Hilson, and has been worked satisfactorily by us both. The end of the unopened bud is sewn up with two or three stitches and the cotton carried on and through the bracteoles; the corolla on falling away hangs down and efficiently labels the boll.

It is probable that the work will be confined to such as can be carried out at Coimbatore since Mr. Sampson and Mr. Hilson are already working on the cottons of the south and north respectively: moreover little time will be available and that will be spent most profitably at head-quarters.

Botanical Garden.—The whole of the unplanted area has been laid out in regular experimental plots, some slight encroachment being made on the ornamentally laid out part in order to get regular plots free from the influence of trees. An old windbreak was removed and a new one of more suitable trees planted in a more useful position. There are now ten plots, representing black, mixed and red soils, with an area of $2\frac{3}{4}$ acres. A thorough trenching, with removal of much rubbish such as ash heaps, broken pots and stones, has improved them, but the land is still somewhat uneven and will require several seasons' thorough cultivation to make it reliable.

Considerable improvements have been effected in the garden as a whole. Irrigation facilities have been increased, especially by the construction by the farm of a cement channel from the Bellary mhote well. Several more varieties of fruit trees have been introduced and some existing trees were moved and regularly laid out. A new plant house, for which a special grant was sanctioned, has been built and forms a valuable addition to the garden. A large number of young trees have been distributed for planting on the estate and to various offices in Coimbatore.

COIMBATORE,
26*th May* 1914.

F. R. PARNELL,
Government Economic Botanist.

APPENDIX V.

ANNUAL REPORT OF THE GOVERNMENT LECTURING BOTANIST FOR 1913-14.

I have the honour to submit my annual report for the official year ending with 31st March 1914.

Staff and leave.—The post of the Government Botanist was split into two distinct posts, the Government Economic Botanist and the Government Lecturing Botanist, in accordance with the sanction accorded by the Secretary of State to provide separate officers for economic work and for teaching at the College and for charge of the herbarium. M.R Ry. Rai Bahadur K. Rangachariar took charge of the office of the Government Lecturing Botanist on the 6th of June 1913.

The staff of the Government Botanist was distributed as per G.O. Press No. 224, dated 22nd January 1914, and the staff under the Government Lecturing Botanist consists of—

		Rs.
1	Chief Assistant	150—10—250
1	Assistant	50—10—150
1	Fieldman	25— 5—50 (biennial).
1	Artist	25—2½—50
1	Plant collector	15
1	Clerk	20—1—25
1	Muchi	10
2	Peons	8

Temporary Establishment.

1	Assistant	50—10—150
1	Fieldman	35
1	Plant collector	12

M.R.Ry. C. Tadulinga Mudaliyar was appointed to the post of the Chief Assistant from the 1st of July 1913, and M.R.Ry. P. S. Jivanna Rao was appointed as the Junior Assistant on probation and he joined duty on the 18th of March 1914. The temporary appointments sanctioned by Government for the herbarium were filled during the year. Mr. Cherian Jacob, a diplomate of this college, was appointed to the post of the temporary systematic assistant and he joined his duty on the 11th August 1913. S. Ramaswami Raju was appointed fieldman and he joined on the 18th August 1913. K. Simeon joined as plant collector on the 11th August 1913, and he left this for the Forest Department on the 1st February 1914, and Rajendram was appointed to the place.

M.R.Ry. C. Tadulinga Mudaliyar returned to duty on the 1st July 1913 after three months' leave (furlough). K. Chinnaswami Pillai, fieldman, was permitted to take up an appointment in Ceylon on the 1st October 1913, availing himself of three months' leave on loss of pay. He has been extending his leave and is still on leave. S. Jobitha Raj was appointed to act for K. Chinnaswami Pillai and he entered on his duties on the 16th November 1913.

Until the appointment of the clerk on the 20th February 1914, the Government Economic Botanist was kind enough to allow his clerical staff to attend to the work of this office.

Tours.—During the year the Lecturing Botanist was away from head-quarters on tour for 26 days and he visited Kambakkam hills, Samalkota, Kannoth hills in Malabar and Melagiri hills in Salem district and Madras.

The temporary systematic assistant and the fieldman toured in Malabar and Chandragiri hills of the North Arcot district.

Teaching.—During the year there were two courses in Botany, one in Elementary Botany for the students of the first year and the other in Agricultural Botany for the second year men. The former consisted of 76 practical classes and 58 lectures, the subject dealt with being the main features in the external and internal Morphology of plants and their life with special reference to the processes of absorption, assimilation, respiration, reproduction and germination. The course in Agricultural Botany consisted of the topics, difference between wild and cultivated plants, the plant and its relation to its environment, detailed study of the common crops, the broad general principles underlying plant breeding and mendelism, seed analysis and testing. There were held 71 practical classes and the same number of lectures were delivered.

The diploma examination was held in December and out of the 15 that were examined 4 passed in first class, 4 in second, and 6 in third and one failed.

The laboratory is now complete as regards furniture and fittings. The want of an experimental house for plant physiology is very much felt. A series of spirit and dry specimens were added to the collection in the biological laboratory for teaching purposes.

A set of 30 diagrams was prepared and 34 pencil sketches were made for the herbarium. The artist also prepared some sketches and painting for the Sugarcane expert.

During the year twenty samples of seeds were tested for germination capacity for the central farm. The seeds of selected crops stored in September 1911 in three different ways (*a*) stored in screw top bottles with some naphthaline inside, (*b*) stored in cloth bags with naphthaline outside the bag, and (*c*) stored in cloth bags after mixing the seeds with ashes, were tested in September 1913, and the results obtained are as follows :—

Paddy—	Cholam—	Kattu Cumbu—
(*a*) 32.	(*a*) 56.	(*a*) 66.
(95) (*b*) 17.	(99) (*b*) 80.	(93) (*b*) 51.
(*c*) 61.	(*c*) 86.	(*c*) 70.

Transvall Cumbu—	Ragi—	Cotton—
(*a*) 82.	(*a*) 80.	(*a*) 26.
(99) (*b*) 87.	(99) (*b*) 82.	(85) (*b*) 40.
(*c*) 90.	(*c*) 87.	(*c*) 45.
Lablab—	**Horsegram—**	**Gingelly—**	**Castor—**
(*a*) 9.	(*a*) 62.	(*a*) 47.	(*a*) 12.
(81) (*b*) 7.	(89) (*b*) 57.	(90) (*b*) 50.	(84) (*b*) 8.
(*c*) 47.	(*c*) 53.	(*c*) 53.	(*c*) 42.

N.B.—The figures within brackets are the germination capacity at the time of storage.

Systematic Botany.—During the year the cleaning and the mending of the specimens in the herbarium were finished and 6,792 sheets of specimens of plants were sent to Kew, packed in tin-lined dealwood cases, for the preparation of the flora of this Presidency by Mr. Gamble.

As the result of the tours made by the Government Lecturing Botanist and his staff, about 1,700 specimens were obtained for the herbarium. From the Calcutta herbarium 46 sheets were received. I am very much indebted to Sir Alfred Bourne and Lady Bourne for a very fine set of about 890 sheets of specimens of plants, collected on the Palnis and Shevaroys. I am very much obliged to Mr. J. R. Henderson, the Superintendent of the Government Museum for drawing my attention to a large collection of specimens of plants both South Indian and extra Indian, stored in the Museum and for allowing their transfer to the herbarium at Coimbatore. I have also to thank him and his staff for the help rendered in the matter of packing the sheets for transmission by rail. The collection has proved valuable.

During the year 2,059 sheets were mounted and 1,067 sheets were incorporated with the sheets in the herbarium. One species of the genus Diospyros collected at Kannikatti by Dr. Barber in 1901 being new was named after him. The 39 sheets of Euphorbias sent to Major Gage on his request were returned.

The settlement officers of the North Arcot district and Salem wanted a general account of the flora of the district. The account already contained in the manual was revised and sent, as a systematic survey of these districts has yet to be made, and as no specimens collected in these districts are in the herbarium. It is proposed to remedy this defect by studying the vegetation of the various districts as time and opportunity permit. As a basis for this work special lists have been prepared from the material available in the herbarium.

About 370 specimens were identified for various correspondents, 160 for Lady Bourne, 61 for Rev. Pfleiderer, 20 for Rev. Munch, 23 for the Government Economic Botanist, 11 for the Deputy Director, Northern Division, 70 for the Range Officer, Kannoth, 4 for Mr. Foulkes, District Forest Officer, 9 for Forest Museum at Coimbatore and 4 for Mr. Anstead.

The study of weeds was continued during the year and it is proposed to issue an illustrated account of the weeds, in the form of leaflets, one for every month from the beginning of the next College year.

Some members of the Royal Commission, Sir Alfred Bourne, Sir Robert Carlyle and the Commissioner visited the laboratory and the herbarium in January 1914.

COIMBATORE,
27*th April* 1914.

K. RANGACHARIAR,
Government Lecturing Botanist.

APPENDIX VI.

ADMINISTRATION REPORT OF THE GOVERNMENT ENTOMOLOGIST FOR 1913-14.

I have the honour to submit herewith the Annual Report of the Entomological section for the year 1913-14.

2. Mr. T. Bainbrigge Fletcher was Government Entomologist until 1st December when having been appointed Imperial Entomologist, he handed over control of the section to the First Assistant who was in charge from 1st December to the 9th January when the present Government Entomologist (Mr. E. Ballard) took up his duties.

3. The entomological section has made great strides since the last annual report was submitted but must still be considered as being in its infancy. The fittings of the laboratory, benches, cabinets and tables are now completed. Eight hundred and fifty store boxes have been received from England and the work of sorting the general collection and storing it in its new quarters is going forward. The arranging of the collection will, naturally, take considerable time and moreover it is being added to every day. Certain groups of insects have been sent to specialists in Europe for identification while those which are of economic importance and whose identification is urgently required are sent to the Imperial Bureau

of Entomology. The insectary was completed by October 1st and is now in full use. Certain alterations on the original plan were found to be necessary as the temperature in the building, owing to the large amount of glass, and the lack of through draught, was too high to keep many of those insects which were under observation in a normal state of health, thus increasing the difficulties attendant on the study of their life histories. The silk-worms were especially affected. The ground round the insectary has been divided into small plots and planted with various crops for the investigation of the lifehistories of pests.

It has been stated above that the section is still in its infancy. This fact necessarily adds much to the difficulty of persuading ryots to undertake co-operative measures to combat insect-pests. It is hoped that by frequent touring and by addressing gatherings of ryots in villages that the existence and usefulness of the section may be so impressed upon them and that they may in time learn not only to apply to the section for advice but to carry out the remedies suggested.

4. The staff has been augmented by three artists who have been engaged in preparing illustrations for Mr. Fletcher's book and in making drawings for leaflets and other publications.

The staff at present includes—

Three assistants.
Do. fieldmen.
Do. artists.
Two setters (one of whom is engaged in printing).
Do. clerks.
One laboratory attendant.
Four peons.

The extension of the temporary appointment of the fieldman in charge of Sericulture in Kollegal has been applied for.

5. *Tours.*—The Government Entomologist (Mr. T. Bainbrigge Fletcher) spent 59 days on tour in Salem and Yercaud (in connection with experiments on the pollination of coffee flowers by bees), Madras (at the investigation of the breeding of mosquitos at the Tondiarpet Sewage Farm), Bangalore (to attend the meeting of the United Planters' Association). Mr. E. Ballard visited Cuddapah, Chittoor, Bellary, Kurnool, Gōdāvari, Kistna and Kollegal. These tours were concerned with mango hopper spraying, insect attack on Cambodia cotton, Deccan grasshopper, possible insect carriers of the palmyra fungus disease and inspection of the work of the Sericultural Fieldman.

The assistants spent 199 days on tour in Bellary, Malabar, Chittoor, South Canara, Kurnool and Coimbatore.

The two fieldmen spent 195 days on tour in Bellary, Kurnool, Malabar and Chittoor. The Sericultural Fieldman has been touring in Kollegal taluk continually throughout the year.

6. *Leave.*—Second Assistant was on privilege leave for one month and one day and the Head clerk for 26 days from 5th June 1913. P. Susainathan (Fieldman) was on sick leave from 24th July 1913 to 11th January 1914.

7. *Leaflets and publications.*—Mr. Fletcher spent most of his time in the preparation of his book on "Some South Indian Insects." Other publications included—

(1) A Bulletin on insect-pests of rice.
(2) A list of insect-pests of cultivated plants in South India.
(3) Leaflet on flies spoiling toddy (English and Canarese).
(4) Leaflet on silk-worm rearing (English and Canarese). Some 53 specimens were received during the year for advice in dealing with their attacks. There has also been considerable correspondence concerning pests of various kinds.

8. *Insect-pests.*—The following are the chief pests dealt with during the year :—

(1) Oryctes rhinoceros, on coconut trees.

(2) Mango hoppers (*Idiocerus neviosparsus*) spraying experiments on this destructive pest were conducted at Chittoor. The results were inconclusive and are to be continued next flowering season. It is desirable that further knowledge of the lifehistory should be gained before it can be dealt with with any hope of success.

(3) *Tribolium ferugineum.*—Observations have been made on the lifehistory of this destructive insect with a view to gaining a detailed knowledge of its habits.

(4) Deccan grasshopper (*Colemania sphenariodes*). Two plots of land about 30 acres in extent were selected and the owners persuaded to plough them thoroughly before the end of January in order to see if by this method the egg masses of grasshoppers could be destroyed. The department was to bear half the cost of ploughing. In one estate only, in Beeravally village, was the agreement fulfilled. The owner of the land was convinced of the efficacy of the measure and stated his intention of continuing early ploughing at his own expense in future years. A full study and knowledge of the Colemania sphenariodes is urgently desired and this work will be undertaken during the present year (1914–15). Leaflets in English, Canarese and Telugu have been distributed in the districts.

(5) *Pempheres affinis—The cotton stem weevil.*—This insect appears to be spreading outwards from Coimbatore district. It is probable that it makes itself felt only when Cambodia cotton is grown and although present over most cotton growing districts does not become dangerous until it can attack an exotic cotton. So far attempts to acquire a detailed knowledge of its lifehistory have not been attended with any degree of success.

(6) *The Cholam fly* (*Fam. Cordyluridae*).—The study of this pest has been more successful than in the case of the foregoing insect. The eggs have been identified (for the first time) and the flies reared. There is now no doubt that its presence in the stems of young cholam is due to the larva boring directly into the plant and not following on the attack of Chilo simplex as was at one time thought probable. No effective means of control have yet been discovered for this widespread pest.

(7) *Calocoris angustatus* (*The Cholam "bug"*).—This insect lays its eggs in the young green grains of cholam, from these young bugs hatch out and feed on the grains. The identification of these eggs, as far as is known, has been made for the first time at Coimbatore this year in the insectary garden (March 1914).

(8) There was a bad outbreak at Manganallur of a swarming noctuid caterpillar which cut off the heads of grown paddy causing a large amount of damage. When reported it was too late for remedial measure to be taken. Very little is known of its lifehistory.

Other insects studied in the Insectary were—

Tabanus striatus. Lifehistory incomplete.
Eligma narcissus. Complete lifehistory.
Natada narana Do.
Hypsa ficus. Do.
Chilo simplex. Complete.
Aphis gossypii. Study of enemies and parasites.
Cantharis rouxi and C. tennicollis.
Mylabris pustulata.
Euproctis on castor.
Aprœrema nerteria.
Stemborer in pulses.
Aulacòphora foveicollis.
Lablab pod borer and leaf miner.
Safflower caterpillar, Perigia capensis.
Red gram leaf roller.
Bruchidae on pulses.
The house fly and its parasites.

In addition to the above a variety of insects have been reared from specimens brought in by the fieldmen and assistants. These were for the most part of no economic importance.

9. *Teaching.*—The course of Entomology of three hours a week for second year students has been continued. As before the three hours were divided into two hours for observation in the field and while one hour was devoted to lecturing. The students were examined by the Imperial Entomologist at the end of March.

10. *Silk.*—During the whole of the year under review a fieldman has been employed in Kollegal with a view to helping the silk industry of that taluk. The industry which was formerly in a most flourishing condition but is now threatened with decay owing to the prevalence of disease, chiefly pebrine, among the silk worms. A great part of the Fieldman's time was spent on tour examining moths and eggs, giving advice on the subject of sericulture and endeavouring to improve the somewhat primitive methods employed by rearers. On the whole his efforts have been accepted by the people in a proper spirit and in time the industry may be re-established on its former footing.

11. Consignments of insects have been forwarded to the following gentlemen for identification and the thanks of the section are due to them for offering to name the respective groups:—

Professor Bolivar (Orthoptera), Professor R. Newstead (Coccidæ). Dr. L. O. Howard (Chalcididæ), the Imperial Bureau of Entomology (various species of different families). Mr. L. Distant (Rhynchota).

E. BALLARD,
Government Entomologist.

APPENDIX VII.

ADMINISTRATION REPORT OF THE GOVERNMENT MYCOLOGIST FOR 1913-14.

I have the honour to submit my annual report for the year ending 31st March 1914.

2. From the 4th May to the 31st October Mr. Shaw, Supernumerary Mycologist, Pusa, was in charge and from 1st November to 2nd November M.R.Ry. S. Sundararaman, my Chief Assistant, was in charge. I held charge for the remainder of the year. The establishment was increased by the creation of two artists' posts—one on Rs. 50–4–74 and the other on Rs. 25–2½–50 in lieu of one on Rs. 15–2–25. Both posts were filled up but one man had to resign for medical reasons and the other resigned to go into private practice. Other two applicants are on probation. Two Fieldmen resigned—one to become a student in the Forest College and the other to go into Bank service. Neither post is yet filled up. Though the pay was raised from Rs. 25–5/2–50 to Rs. 35–5/2–50, that is, to the same grade as Assistant Farm Managers with a view to attract diplomates of the College, none have applied. M.R.Ry. T. R. Ranganath was confirmed in the service as an assistant in Mycology.

3. *Leave.*—I was on combined leave for 6 months from 4th May 1913 to 2nd November 1913. The First Assistant was on privilege leave for six weeks, the Second Assistant for 1 month and 16 days and the fieldman for 1 month.

4. *Tours.*—Mr. Shaw was on tour for 64 days and I for 58 days in the year; the First Assistant for 111 days, the Second Assistant for 102 days, the three Fieldmen together for 239 days and the Plant collector for 60 days. This large amount of touring in connection with executive and advisory work cuts down very much the time that can be given to investigation. Touring was done in the districts of South Canara, Malabar, Coimbatore, Salem, Chingleput, Tanjore, Tinnevelly, Nellore, Gōdāvari, Kistna and in the State of Cochin.

5. The bud-rot disease of palmyras in Gōdāvari and Kistna districts was kept under observation. Considerable efforts have been made to check the spread of the disease in the Gōdāvari uplands and a belt about 5 miles wide is being patrolled round the edge of the infected area by the special staff. The disease is still severe in the deltaic tracts, but the number of dead trees is less this year. In 450 villages 66,526 palms were cut. In Kistna district the infected area has decreased, the number of infected villages being reduced to 49 and the number of trees cut to 4,835.

6. The small infected area of 1,000 acres round Chikkala where palmyras grow in forest formation has been thoroughly dealt with. Only palms that have been examined by the special staff are allowed to be tapped for sweet toddy. During this operation on palms that looked outwardly healthy and quite suitable for tapping it was found that of 12,066 palms examined 966 were diseased. This is a high percentage of disease in an incipient stage and this area deserves the careful attention it is getting.

7. Much progress has been made in persuading tree owners to have the diseased tissue cut from palms that have the characteristic spots on their leaf-blades and this has led to the saving of several thousands of trees from death. The number of these in both districts this year was 29,400.

8. The bud-rot disease of coconut palms found late last year in Malabar has been diagnosed as caused by Pythium palmivorum Butl. A special staff under the Collector has been employed to mark down the infected trees in the district and have them cut and burned. 1,926 diseased palms have been located. The disease is more widely scattered within the district and not nearly so severe as in Gōdāvari and Kistna districts. The disease was also found on palmyras in Peruvaje in the south part of South Canara and they have been destroyed.

9. The fungus Pythium palmivorum was brought into culture on oat agar and French bean agar by my Second Assistant T. R. Ranganath. From pure cultures young seedling coconut palms in pots were inoculated and 80 per cent. of them took the disease. A memoir of this work by Mr. Shaw who was then in charge is now in the press. On my return from leave eight young coconut palms growing on the farm were inoculated from a pure culture got from a coconut palm from Kurumathur, Malabar. Six of them have shown the characteristic signs of the disease and two have died. The fungus has been re-isolated from them.

10. Nine young palmyras growing on the farm were inoculated with a pure culture got from a palmyra in Gurusanapalli, Gōdāvari district. Eight of them showed the characteristic signs of the disease and all have died. The fungus has been re-isolated from them. The fungus is now definitely proved to be the cause of the disease. Experiments in cross inoculations are delayed till more young palm seedlings become established.

Cultures and inoculations of a coliform bacillus cultivated from the soft-rotted part of the bud of a coconut palm attacked by bud-rot were discarded during my absence on leave but a new series of cultures and inoculations have been made. This work is again being done in conjunction with the Government Agricultural Chemist.

11. The campaign of spraying arecanuts with Bordeaux mixture against mahali or koleroga disease, Phytophthora omnivoravar Areca Colem, was continued this year in the district round Chalisseri and extended to Mulasseri on the coast and to Nagodi in the South Canara uplands. The fruit bunches of 14,000 palms were sprayed and during May, June, July practically the whole of my staff was engaged on this work. Advantage was taken of every period of dry weather during the monsoon to spray. In order to bring it to the notice of as many garden owners as possible blocks of palms were sprayed just sufficiently large to show the owners that the crop of nuts from the sprayed area was greater than from the rest of their garden. A few of them did the work themselves under supervision. The disease was not severe this year and the contrast was not so great as in former years. It is this fact that makes it difficult to popularise the operations so that they may become the usual garden practice. The work will be continued next year. The Chief Assistant who is working on smuts of cholam had successful inoculations with short smut Cintractia sorghi vulgaris and whole head smut Ustilago Reiliana.

12. The following new fungi were kindly named by Herr H. Sydow —

Fusicladium Pongamiæ on Pongamia glabra.
Cylindrosporium Gyrocarpi on Gyrocarpus americanus
Meliola Opeliæ on Opilia amentacea.
Asterina crebra on Opilia amentacea.
Puccinia aggregata on Strobilanthus.
Puccinia paraffinis on Justicia diffusa.
Napicladium cratævæ on Cratæva religiosa.
Cercospora subsessilis on Melia Azederach.
Exosporum Tamarindi on Tamarindus indica.
Vermicularia Capsici on Capsicum frutescens.
Vermicularia Curcumæ Curcuma longa.

13. A three months' course in plant diseases was given to the students in the last term of the second year. It was essentially practical and comprised the life history of a typical saprophyte and a parasite, the relation of parasitic fungi to their host-plants, reproduction and distribution, the principal diseases of the more important crops of the Presidency and methods of prevention. An examination was held at the end of the term and of 15 students who presented themselves four were placed in the first class, six in the second and five in the third. Dr. L. C. Coleman, Director of Agriculture, Mysore, was the external examiner.

14. Twenty-three bundles of specimens of diseased plants were received from outside for identification and advice and ten more places were visited to give advice. Seventy specimens of fungi were collected and specimens were supplied to various places.

15. The following leaflets were published during the year 1913–14:—

(1) The mahali disease of Arecanut palms, in English and Malayalam.
(2) Preparation of Bordeaux mixture, in Malayalam.
(3) The bud-rot of Coconut palms in Malabar district, in English, Malayalam and Canarese.

COIMBATORE,
30*th April* 1914.

W. McRAE,
Government Mycologist.

APPENDIX VIII.

ADMINISTRATION REPORT OF THE GOVERNMENT SUGARCANE EXPERT FOR 1913–14.

I have the honour to forward my annual report for 1913–14. I remained in charge of the office throughout the year although a considerable part of the time was spent on tour. There was no change in the major officers but several among the middle grades. The Assistant Manager was transferred and the artist left the office without permission. There was at times great difficulty experienced in filling vacancies because of the temporary nature of most of the appointments and numerous pieces of work which I had hoped to carry out had to be abandoned. I have pleasure in testifying to the zeal of the higher officials in doing their work, often under considerable difficulties.

2. I was absent in North India for over four months and visited Sabour, Pusa, Cawnpore, Aligarh, Shahjehanpur, Lyallpur, Gurdaspur and Peshawar, studying the canes and the local conditions of cane growing. The work at head-quarters however prevented any large touring among the staff. A careful examination of the native Indian canes was made wherever possible and numerous varieties were collected and sent to Coimbatore. The seedlings

were submitted to an exhaustive study as to their inheritance of agricultural, chemical and morphological characters, but this work had to be carried on in rather a desultory manner at head-quarters because of lack of staff. A special study of the Punjab canes was however completed and the results of this study were collected in a paper which has been sent to Pusa for publication. It is intended to deal with all the Indian canes in like manner as opportunity offers so as to leave behind a fairly complete monograph of these interesting varieties.

3. The work of the farm was largely construction and arrangement, the land being only acquired and entered upon on the first day of the official year. The engine was got into order and a shed built over it; a cattle-shed was built and four more pairs bought, bringing up the number to the six pairs sanctioned; an implement shed with store-room and artists' and clerks' quarters were built; a metalled road was made from the office of the central farm to the laboratory, a distance of a mile and a half, and an intervening dry river was spanned by a bridge 8 feet wide. Owing to the alkaline nature of most of the land, due to being irrigated by alkaline wells for thirty years, somewhat drastic measures were employed to improve the soil, including the digging of many drains, burying quantities of madar (Calotropis gigantea), carting hundreds of loads of tank silt and prickly-pear earth, and sheep penning on a large scale. These measures will, it is hoped, prove effective and the new seedlings and varietal plots will be planted on some of this reclaimed land. The well to which the oil-engine was attached has proved to be exceptionally reliable with water of good pure character, and it is thought that the land will rapidly improve under free irrigation from it. Permission has been obtained from Government to utilise the Chettipalayam irrigation channel whenever needed, but it is hoped that this right will not have to be enforced. The whole farm has been surveyed, divided into blocks and mapped. The water of all the wells has been analysed together with that of different places in the neighbourhood where sugarcane is grown.

4. The work has excited a good deal of attention and there have been numerous visitors to see the new canes which, to the number of 40,000 (of all ages), have sprung into being through the sowing of the cane arrows. Among these visitors might be mentioned His Excellency the Governor, Sir Harold Stuart, Lord Islington and several members of the Royal Commission, Sir Robert Carlyle, the Agricultural Adviser to the Government of India, and most of the Members of the Board of Revenue. During the meeting of the Board of Agriculture many of the delegates also visited the farm and inspected the canes.

5. I now proceed to give, in brief, the actual work of cane-breeding during the year.

The 1912 seedlings, raised at the Botanic garden, were transferred and planted in duplicate, one plot being on the alkaline land and the other on slightly alkaline land but irrigated with sweet water. An interesting fact has already come to light in that most of these seedlings have very much improved in their sugar content in their new surroundings, two of them to the surprising extent of over 6 per cent. sucrose in the juice. This has led to the natural suggestion that they may behave very differently in North India where the growth is much easier and more rapid for part of the year, and a set of six has been distributed to four centres in North Indian cane regions to gain experience in this direction.

6. The 1913 seedlings, sown at the Botanic garden, have been successfully transferred to the new farm and have grown remarkably well. They were planted in pits 2 feet each way and well treated as regards irrigation. Much work was done in classifying them and studying their characters, but this work had to be largely abandoned because of the inadequacy of the staff (Government has recently granted an increase). About four hundred analyses have already been made, mostly of a preliminary nature, and I have pleasure in acknowledging the great help that I have received from Mr. Harrison, the Agricultural Chemist of this College, in this and other directions. Some of the canes appear to be surprisingly good, Seven have already been discovered with over 19 per cent. of sucrose in the juice, and more than 50 with over 17 per cent. A great deal of trouble was experienced at first with jackals and afterwards with rats, but, by constant attention and the trying of various remedies, these pests have been got under. Some of the plants have however been destroyed by the rats, which burrow extensively under the stools and cause the canes to fall over.

7. The 1914 seedlings are now fairly well established and some hundreds already planted out. The failure of the farm canes to arrow increased our difficulties a good deal but, by using the fields of villages within a range of 10 miles for obtaining seed and pollen, together with the canes growing at the Central farm and Hebbal, we were able to procure 150 lots of arrows, sown in 500 seed pans and of 60 different combinations of parents. Altogether 101 cages were put up for the purpose of selfing and crossing different kinds and some very interesting results have been obtained. I have especially to thank Dr. Coleman of Bangalore, for allowing me the free use of his Hebbal canes for this work. Owing to shortness of staff the work had to be placed under a peon who was there for three months, but it is hoped that this important out-work will be under a more responsible officer in the future. The ideal aimed at is to cross the hardy North Indian canes with local richer canes, but we have not been able to cause the North Indian canes to flower with us. Sets of them have now been planted in the heavy land on the Central farm and at Samalkota and Taliparamba alongside of selected good South Indian canes, and the work of next year promises to be of special interest.

8. The collection of varieties has been largely increased, over 250 plots having been laid down during the twelve months. About 50 lots of canes have been sent to various parts of India, but distribution can never be an important item in the work of the farm, excepting in the sending out of selected seedlings to be tested on Government farms elsewhere. For general distribution a much larger area of land under cane would be necessary and it is thought advisable at present to adhere to the plan of throwing this distributing work on to the local cane farms in the different provinces, where the proposed introductions can first be properly tested under the local conditions of soil and rainfall.

COIMBATORE,
15*th April* 1914.

C. A. BARBER,
Government Sugarcane Expert.

APPENDIX IX.

(i)

ANNUAL REPORT OF THE PISCICULTURAL EXPERT, MADRAS FISHERIES DEPARTMENT, 1913–14.

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6. *Sunkesula fish farm.*—The Superintendent Durvasulu Pillai resigned his post during the year and a temporary man was appointed (a pensioned sub-overseer from the Public Works Department).

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9. *General work.*—The general work at the Sunkesula fish farm progressed during the year, the new Superintendent taking more interest in the detail work, keeping the screens in order, etc.

10. Experiments were carried out with the eggs and fry of *Ophiocephalus punctatus* and *O. striatus re* hatching and rearing under artificial conditions.

11. It was discovered that several minute water insects play an important part in the destruction of the ova and fry under natural conditions. The worst offender in this respect was found to be the small water flea "Daphnia pulex." These minute insects attack and destroy the fry in their early stages and the ova throughout the hatching period. Frogs destroy both ova and fry, but the parents who guard their eggs and young can deal with this natural enemy, whereas they are helpless in the former case.

12. Fishermen take advantage of this parental affection for the capture of the big fish. They locate a nest and bait with a frog which they dangle in close proximity to the eggs or fry and the parent fish are easily caught. The eggs or young fry are then left to the mercy of all enemies and consequently very few if any survive out of the original number in the nest.

13. The experiments were to determine the following, viz. :—

(1) Most suitable hatching appliances ;
(2) Periods of hatching at different temperature ;
(3) Most suitable water temperature for producing healthy fry ;
(4) Best artificial food for rearing fry ; and
(5) Rate of growth, etc.

14. These experiments are not yet complete but a lot of useful information was obtained.

15. The most suitable hatching appliances were found to be glass tanks where the eggs and fry can be kept under constant observation and the presence of minute enemies detected at once. The water temperature ranged between 76° and 84° fahr.—an average temperature of 78 seemed to be preferable. Various artificial foods were tried, the most suitable for the very early stages (just after absorption of the yolk sac) seemed to be the soup of crushed crab.

16. Notes on periods of hatching rate and growth of fry were taken together with specimen fish carefully preserved at various stages.

17. Before any work can be published on the artificial hatching and rearing and most suitable appliances for dealing with these particular fish, it will be necessary to carry out further experiments and this will be done in due course.

18. Many thousands of Murrel fry were removed from the Sunkesula farm during the year and turned into Edurer swamp for growing purposes. Large numbers of the quick growing varieties of carp from the farm were distributed over 60 miles of the Kurnool-Cuddapah Canal. Great difficulty of rapid transport is found and I am afraid to transport fish below the locks to Nandyal, Ayyavankodur and Kanala tanks would take too long to stock with the present

methods and they will have to rely for the present on the extra fish from the upper waters. The motor-boat unfortunately was found not powerful enough for this work.

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20. During the year under review a new and valuable larvicide "Polyacanthus Cupanus" was transported from the West Coast (Cochin) to the Fish farm, Sankesula, for breeding and distribution purposes. Some fresh blood was introduced amongst the other larvicides at the farm from Cuddapah (Haplochilus panchax).

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22. *Live fish market.*—The construction of the live fish market sanctioned in G.O. No. 1191, Revenue, dated 23rd April 1913, was completed and fish will be sold therein soon after the opening of the canal, *i.e.*, after the 15th June next.

23. *Hilsa hatchery.*—During the year under report, I visited the hatchery at the Lower Anicut but there were no ripe spawners obtainable. The Sub-Assistant whom I sent in advance to fit up the hatchery was able however to secure a ripe female and hatch the eggs successfully. As the water in the river went considerably low and there were no further runs of fish, the work was closed for the year.

24. *Stocking of tanks.—Daroji tank.*—This was stocked in October last with suitable fish obtained from the Sankesula fish-farm. The fishery has been rented out during the year under report.

25. *Markapur tank.*—This tank which was substituted for Cumbum tank was stocked with quick growing varieties of carp in October last and the leasing of the fishery of both the tank and supply channel fetched a sum of Rs. 145–4–0 during the year.

26. *Barur tank.*—This tank was not again stocked; but the fishery has been leased out under my instructions. The taking over of the fishery of certain irrigation tanks fed by the supply channel to the Barur tank has been sanctioned by Government.

27. The above tanks will be stocked during the current year.

28. *Collair scheme.*—This scheme has received the general sanction of Government, but the submission of detailed estimates called for in G.O. No. 61, Revenue, dated 6th January 1913, is being delayed owing to the settlement of the two important questions, viz., removal of stake nets and fixed engines. As for the proper working of the scheme it is absolutely necessary that the fixed engines, etc., should be removed, nothing can be done in the matter until the above difficulties are settled.

29. *Nellore fishery.*—As mentioned in my last year's report, a site was selected for the establishment at Allur near Allur Ramannah tank and trial borings were made. In all the borings made a good water-supply was obtained, but unfortunately the salinity of the water was so great as to be quite useless for piscicultural purposes. Hence the site had to be abandoned. A fresh site has since been selected at Ipur Kamini tank under the Surveypalli Reservoir system. My proposals to establish a fishery here were recently submitted to the Honorary Director.

30. This fishery will be a most interesting and valuable addition to the piscicultural work. It is designed to deal with all the most valuable larvicides which will be bred and distributed throughout the Presidency. A hatchery will be constructed to deal with the eggs of the larvicides and for experimental purposes *re* possible transport of the fertilized ova. If successful, this will mean great saving in carriage as practically no water will be required.

31. The hatchery will also deal with Murrel eggs and possibly the ova of Gourami.

32. Though the close proximity of the Vupperteru river where I recently found hilsa it may be possible to obtain ripe fish during the breeding season and if so, they will be dealt with at the hatchery.

33. It is proposed to introduce Gourami to this fishery and tench if it is found possible, to acclimatise the latter.

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36. *Acclimatisation of tench.*—I visited Bangalore and district in February and March with a view of finding suitable waters about 3,000 feet elevation for the first step in acclimatising tench.

37. The proposal is to bring these fish from the Nilgiris to waters about 3,000 feet above sea level then after they breed to remove the fry to Sankesula fish-farm which is about 8 or 900 feet above sea level, if they are successful here to remove the fry again to the proposed Ipur fishery which is practically at sea level. Some difficulty was found in obtaining a suitable site and I inspected most of the tanks in the neighbourhood of Bangalore and the country round Matigiri and Hosur in Salem district. Eventually I selected a site close to Matigiri called the 'Jeegor' tank and a small tank near to it. I have recently submitted my report on this.

38. *Anti-Malarial work at Cuddapah.*—In accordance with instructions, I visited Cuddapah in November last and stocked several tanks and all the wells in the town with mosquito larvicides.

39. The wells were inspected before stocking and a large number were found very dirty with floating debris, and well supplied with mosquito larvæ.

40. Before leaving Cuddapah they were again inspected and found comparatively free of larvæ.

41. I drew up a report with suggestions which has been sent in to Government.

42. I was requested by the authorities to try and find a suitable place for breeding larvicides and I visited the most many likely places within a radius of 20 miles of Cuddapah.

43. I selected a most useful place with permanent water called Pedda Gardi, some 12 miles from Cuddapah. I propose stocking this gardi with the most useful larvicides, and as it has direct communication with Dongola Cheruvu and the 'Bugga' river they will be naturally supplied each wet season. This will be augmented by supplies sent up from the proposed new larvicide fishery at Ipur.

44. The Cuddapah work took up considerable time as I had to visit the district no less than three times during the year under review.

45. *Elephantiasis work at Cochin.*—With reference to G.O. No. 1169, Public, dated 18th September 1913, I visited Cochin with Major Ross, I.M.S. We made a thorough inspection of Cochin. A large number of wells were stocked with fish and numerous drains and stagnant waters were treated with kerosine.

46. Other drains were opened up to tidal influence. A joint report was drawn up by Major Ross and myself embodying our proposals and this was submitted to Government, Local and Municipal Department.

47. *Nilgiri fisheries.*—As I was asked by the Director of Fisheries (Punjab) to supply trout eggs to the Punjab Government, I put down a number at Avalanche hatchery in January.

48. The Director (Mr. Howell) was asked to send a man to look after the eggs on the journey, but as he could not spare one, the arrangement fell through.

49. A consignment of trout were promised to Travancore by the Madras Government and eggs were put down at Avalanche in January to meet this and the fry are now ready for transport.

50. The rivers are well stocked with trout and the past season has been a most successful one, a number of large fish being taken.

51. There has been a shortage of live food in some of the rivers and this is receiving my attention. Transporting and stocking operations (live fish food) were carried on during the year and the old ponds at Pykara are being put in order for growing food.

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53. Many Municipalities have been supplied with my special fish carriers during the year and many have requested stocks of larvicides to be sent. It is impossible to carry out the latter until our larvicide farm at Ipur is working.

54. During the year I have inspected and stocked with larvicides a number of small tanks and wells in Madras City and other parts of the Presidency while on tours of inspection.

55. Experiments were carried out during the year in connection with larvicides for anti-malarial work and a lot of useful information obtained.

56. I have drawn up an article on the treatment of streams, ponds, wells, etc., from an anti-malarial point of view. This is now in the press and will be published with plates shown in the various larvicides mentioned in the article for the benefit of the public

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(ii)

REPORT BY Mr. J. HORNELL, F.L.S., MARINE ASSISTANT ON MARINE PISCICULTURE IN MADRAS DURING 1913-14.

During the year under review practical fishery work other than pisciculture has occupied the bulk of my time. The chief piscicultural items which received attention were—(*a*) Edible oyster culture at Pulicat, (*b*) the planning of a pearl-culture farm at Pamban, (*c*) investigation of the larval history of the pearl oyster. No progress could be made with the construction of the sanctioned fish-farm at Tuticorin owing to excessive delay in the delivery of the necessary material ordered in England. This has now been received and the work of construction will be taken in hand in September of this year.

2. *Edible Oyster Culture.*—The oyster farm at Pulicat has now been placed on a stable, basis and the work systematised; the coming year should see it earning a profit. Even as it is, the concern, were it in capable private hands, would now be commercially remunerative, for

several items of expenditure would then be susceptible of considerable reduction. Efficient supervision of a small enterprise situated in a locality difficult of access, is bound to be unduly expensive, and much of the profit is swallowed up thereby.

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3. The spatfall of November-December, 1912, was extremely abundant and made such good progress that a considerable proportion of young oysters was fit or sale at the end of January 1914, when they were barely 14 months old. From 23rd January 1914 when the season opened, till 31st March 1914, sales amounted to 21,450; although the size was necessarily small, quality was good and I anticipate a greatly increased demand during the coming year. The stock is large and amply sufficient to meet any requirements. These oysters should reach perfection early in 1915, when they will be 2¼ years old.

4. Arrangements have been made by the Government of Baroda to send a student to Madras in the present year to receive instruction in practical oyster-culture.

5. *Pearl Culture Farm.*—Owing to the successful progress of my experiments in the forced inducement of pearls in nacre-shelled molluscs, I have elaborated plans for the construction of a pearl-culture establishment at Krusadai Island, two miles south of Pamban Pass. The site was selected after very careful consideration of all the possible sites on the Madras coast. In many respects it is unique; it centres in a small deep-water bay on the northern side of a low coral reef. In all directions this bay is sheltered from strong winds and in spite of this landlocked condition, the current washing its shore is always strong owing to its proximity to Pamban Pass, where the swiftest current known on the Madras coast constantly runs. An ample food-supply will be available to the oysters.

On February 25th His Excellency Lord Pentland, Governor of Madras, was pleased to inspect the site.

* * * * *

During the year under review the original specimens of "free" pearls produced by my method have been deposited with the Linnean Society, London, together with a short preliminary note.

7. *Investigation of the larval history of pearl oysters.*—Much attention has been devoted during 1913-14 to a study of the free-swimming larvæ of the pearl oyster and of the conditions affecting their dispersal. Very fortunately large beds of maturing pearl oysters were found in Palk Strait, a locality to which little attention has hitherto been given by those in charge of Pearl Bank inspection. The most important observations made by means of an investigation of the plankton in Palk Bay show that when the free-swimming larval stage characterised by the possession of an embryonic shell is reached, the larvæ tend to mass together in immense myriads whenever the local drift drives them into an embayment or wherever an eddy is produced by opposing currents or the configuration of the coast line. Still more important was the discovery that two later stages which hitherto have been considered as fixed or attached stages, may have considerable freedom of dispersal apart from the power of restricted locomotion provided by their crawling habits. In Vol. V of Professor Herdman's Ceylon Pearl Oyster Report, these two stages of shelled larvæ are figured respectively as Figs. 23 and 27 on General Summary Plate. As stated in the letterpress these larvæ were found by us attached to sea-weeds; now, however, I can state positively that both stages may be transported by any strong current or drift. As the large stage (Herdman, *loc. cit.*, Fig. 27) is probably at least a fortnight old, this discovery extends very considerably the period during which the larvæ are at the mercy of currents and will enable them to be dispersed to greater distances than we have hitherto believed possible, when the free life of the larva was understood not to exceed seven days as a maximum. Herdman's Fig. 23, showing a wide margin of prismatic shell-structure added to the embryonic shell, which I will call stage II of the shelled larvæ, *is most distinctly free-swimming*, its method of progress being the snapping together of its valves after the manner of the Glochidium-larvæ of Anodon. This stage I found in large numbers in plankton obtained both on the surface and at 1½ fathom depth, the total depth of water being 2¼ fathoms at this particular place.

8. I have also been able to find very definite distinguishing characteristics in the young stages of the Pearl Oyster, thereby enabling one to distinguish them with certainty from the young of the allied mollusc, *Avicula vexillum*, a matter hitherto of the greatest difficulty.

* * * * *

10. For three months of the year under review, I was out of India on privilege leave. A considerable portion of the available time in Europe was devoted to a study of musselculture in the south of France. It is hoped to utilize the experience thus gained in improving the mussel industry on the Malabar coast and elsewhere, as a fine mussel, *Mytilus smaragdinus*, is abundant both in Malabar and Ganjām; in the former district large quantities are gathered from the rocks in shallow water, and find a ready market among the shore people.

Government of Madras.

REVENUE DEPARTMENT.

Read. } 1914. *Enclosures*

Regd. } *Spare copies*

G.O. No. 2547, 2nd September 1914.

Report on the operations of the Department of Agriculture

Recording, with remarks, the — for 1913-14.

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

Read—the following paper :—

Proceedings of the Board of Revenue (R.S., Sur., L.Rds. and Agri.), No. 218, dated 1st August 1914.

The Hon'ble Mr. Ll. E. Buckley.

The Board begs to submit to Government the report of the Director of Agriculture on the operations of the Department of Agriculture for the year 1913–14.

The notable events of the year were the opening of two additional farms, the addition of two gazetted officers to the staff, the meeting of the Board of Agriculture at Coimbatore, the preparation of an important book on the South Indian insect pests by Mr. Bainbrigge Fletcher, and the decision to alter the curriculum for future years.

2. *Staff.*—Mr. Chadwick, I.C.S., was in charge of the office of Director of Agriculture throughout the year. Mr. Wood and Mr. McRae were absent for six months on leave and Mr. Sampson and Mr. Shaw, the latter of whom was lent from Pusa, took their places temporarily. M.R.Ry. K. Ramasastrulu Nayudu Garu, Assistant Director of the Southern Division, managed that division a second time without an assistant until the reversion of Mr. Sampson. Four new gazetted officers of the Indian Agricultural Service joined the Madras staff on probation. Mr. Parnell from the Indigo Research Station, Sirseah, joined the post of Economic Botanist on May 13th, in the place of Dr. Barber transferred to the charge of the sugarcane breeding station. Mr. Thomas who was selected by the Secretary of State for the post of third Deputy Director referred to in the last year's report, arrived on November 7th, but instead of being posted to the charge of the West Coast districts and Coimbatore as well as to assist the Principal, he was with the approval of Government put under training first under the Principal at Coimbatore and subsequently under the Deputy Director in the Southern Division. The West Coast districts and Coimbatore will remain part of the charge of Mr. Sampson while the Principal of the Agricultural College, is to be given relief by the appointment of a member of the Provincial Service as Assistant Principal. On the 6th of January 1914, Mr. Ballard from Nyassaland took charge from Mr. Fletcher as Government Entomologist and the latter reverted to Pusa to take up the post of Imperial Entomologist to which he had been nominated by the Government of India a year ago. Mr. Mehta who is a supernumerary officer was posted to this Presidency by the Government of India and as he had already two years' experience in other parts of India, a new central division comprising the districts of Chingleput, North and South Arcot and Chittoor was created and he was placed in charge of it. On the appointment of Mr. Parnell as Economic Botanist, M.R.Ry. Rai Bahadur K Ranga Achariar Avargal was advanced to gazetted rank as Lecturing Botanist with charge of the herbarium.

3. *Buildings.*—The buildings which were referred to in the last year's report as being unfinished have all been completed during the year. In the meantime sanction has been accorded for the construction of fresh buildings in order to meet fresh demands occasioned by the additions that were made to the staff.

4 *Agricultural stations.*—During the year under review there were ten agricultural stations at work including the newly opened station at Sirvel in the Kurnool district. The activities of the department chiefly centred on the selection of seed, and of the best varieties of crops, the reduction of the seed to the transplantation of paddy and the use of manures.

Sugarcane.—The cultivation of this crop continues to spread on the West Coast, the area under it having more than doubled during the year under report. The total area is not, however, large but it has to be remembered that on the West Coast this crop is not cultivated in large blocks but is scattered about in many homesteads. As a result of the labours of the department a complete alteration appears to have been effected in the local practice of milling canes and of preparing jaggery.

Cotton.—Attention continued to be devoted to the improvement of the quality of this crop. The work is confined chiefly to Tinnevelly and the Ceded districts. In Tinnevelly, the work developed greatly during the year. The Board has pleasure in acknowledging the help given by Messrs. Harvey and Company. A noteworthy feature is the formation of two Agricultural Co-operative Societies for the promotion of the cultivation of cotton from pure seed. The season in Bellary was unfavourable and this greatly interfered with the sale of improved seed to the ryots. But in Kurnool the work received no such set-back. Cambodia cotton is stated to be now thoroughly established especially in the south of the Presidency. Complaints as to its deterioration are nevertheless common although they are not made with regard to samples of the crops grown under wells. The Director attributes the deterioration to the fact that the ryots induced by the yield of high profits have extended the cultivation of cambodia cotton to dry lands and that the quality of such cotton grown on dry land compares unfavourably with that obtained from cultivation under wells. The Director observes that until the trade in this cotton is better organized so that grades in it are recognised and payments made accordingly, it is difficult to see how the mixing of the different qualities can be prevented.

Paddy.—The practice of sowing single seedlings continues to spread although it is stated to be impossible to estimate the area affected by it. It is remarkable that in the floods in the South Arcot district, the fields which had been transplanted with single seedlings were not so severely damaged as other fields. Mr. Harrison has continued his investigations in connection with the cultivation of paddy, which were referred to in the last year's review.

Green manuring.—The operations in connection with this important branch of the Agricultural Department's work were highly successful during the year under review, more than thrice the quantity of seed disposed of in the previous year having been sold. The actual area over which the seeds were used with success is stated to be difficult to ascertain as private agencies have also started the sale of these seeds. In Chingleput the departmental sale is remarkable in view of the Director's statement that it has not been possible to spare trained men to instruct the local ryots in the use of this crop. This is a striking proof of the extent to which the improvements advocated by the department are being adopted by the ryots on their own initiative and an interesting incident illustrative of the same tendency is related by the Director in paragraph 48 of his report.

Palm disease.—Hitherto the operations for the eradication of this disease were confined to the removal of dead trees in order to prevent them from becoming centres of further infection. But, now, infected living trees are being operated upon and it is hoped that under this altered system more permanent results will be achieved in the future. As it is, there is a decided abatement of the disease in Kistna, while there are indications of hope in Gōdāvari. The outbreak of disease among the cocoanut trees on the West Coast which is ascribed to the same fungus is also being combated. It is, however, not so severe in intensity although it is more widely spread than was originally thought. The mahali disease affecting the areca tree is also being dealt with by the department. The outbreak, however, was not so severe as in the previous year. It is encouraging to find that ryots have started spraying their trees themselves.

5. *Sugarcane breeding station.*—Work is proceeding vigorously on this station and no pains were spared by Dr. Barber and his senior Assistant. The idea of the work is to send those canes from this station, which Dr. Barber considers promising, to the farms in Northern India for trial there, but it is unfortunate that none of the Northern Indian canes brought to Madras flowered during the year under review.

6. *Agricultural instruction at the College of Agriculture.*—Only nine students went up for the diploma examination; all of them were successful. It is disappointing that so few passed out. The revision of the course at the Agricultural College referred to in the last year's review was approved by the Board of Agriculture which met at Coimbatore in December 1913, and Government have since accorded their sanction to the introduction of the revised course from the beginning of the current term. It is hoped that under the new curriculum a larger number will take the full course.

7. *Agricultural Associations and Exhibitions.*—Cattle shows were held at Ongole, Tiruppur and Madura. Government have passed orders on Mr. Sampson's report and they agree with him that these shows serve no useful purpose generally. Of the old District Associations only Ganjām and Kumbakōnam appear to exhibit any vitality. Mr. Chadwick, however, remarks that hope lies in the formation of village associations concentrating attention on definite items of work as well as agricultural co-operative societies working for the realization of profit. Thanks to the influence of the Collector, Mr. Innes, a fair number of the former type has been formed in Malabar while three of the latter have been formed elsewhere. The report regarding the future of the Central Agricultural Committee has been received from the Director of Agriculture and referred back to him for further consideration.

8. *Meteorology.*—The rainfall registered at the various raingauge stations in the Presidency was tabulated as usual and the results were published by the Meteorologist, Madras, and Deputy Director of the Madras Observatory. The total number of rain recording stations in the Presidency at the end of the official year 1913-14 was 475 inclusive of 84 in the Native States and Coorg against 474 at the end of the previous year, and of these 377 stations were inspected.

9. *Statistics.*—The following returns were published in connection with local enquiries under provincial direction: (1) monthly season reports in three sections, rainfall, cultivation and prices of food grains and salt and (2) two half-yearly reports of cattle mortality.

10. Mr. Chadwick and the officers of the department may be congratulated on a year of hard work and substantial progress and the Board desires to record its appreciation of the help it has received from many quarters, especially from those whose names are mentioned in the concluding sentence of the Director's report.

(True Extract.)

T. Raghaviah,
Secretary.

To the Secretary to Government, Revenue Department.
,, Director of Agriculture.

Order—No. 2547, Revenue, dated 2nd September 1914.

Miscellaneous.

Recorded:

2. Mr. Chadwick's report furnishes a full and clear account of the operations of the Agricultural Department during the official year 1913-14. There is evidence of substantial progress in many important directions, and the record of work done goes far to justify the proposals for additions to the staff of the department to which reference is made in paragraph 3 of the report. The reorganization involved has formed the subject of a recent communication to the Government of India and the orders of that authority are awaited.

3. Paragraph 53 of the report brings together the salient features of the administration during the period under review, and the Resolution of the Board refers specifically to some of the more important aspects of the year's working. Much valuable research was carried on by the scientific sections of the college and the Government have perused with interest the memoirs embodying the results of their investigations. A special word of recognition is due to the late Entomologist, Mr. Bainbrigge Fletcher, for his valuable monograph on the insects of Southern India and to the mycological branch for the success which has attended its efforts to isolate the fungus causing bud-rot in the palmyra.

4. His Excellency the Governor in Council has pleasure in endorsing the Board's appreciation of the work of Mr. Chadwick and the officers of his department,—among whom mention should particularly be made of the College Principal,—Mr. R. C. Wood, the senior Deputy Director of Agriculture, Mr. H. C. Sampson, the Agricultural Chemist, Mr. W. H. Harrison, and the sugarcane Expert, Dr. C. A. Barber.

5. The Government await the promised report on the future of the Central Agricultural Committee and District Agricultural Associations called for in G.O. No. 360, Revenue, dated the 5th February 1913.

(True Extract.)

L. Davidson,
Ag. Secretary to Government.

To the Board of Revenue (Revenue Settlement).
,, Director of Industries.
,, Honorary Director of Fisheries.
,, Educational Department.
,, Local and Municipal Department.
,, Public Department.
,, Public Works Department.
,, Agricultural Adviser to the Government of India
Copy to the Government of India
Department of Revenue and Agriculture } with C.L.
,, Government of India,
Department of Commerce and Industry
Editors' Table.

ERRATUM SLIP TO THE REPORT OF THE DEPARTMENT OF AGRICULTURE, MADRAS PRESIDENCY, FOR THE OFFICIAL YEAR 1914–15.

Page 19, *paragraph* 64.—*For* the fourth sentence of this paragraph, *read* the following :—

"We have just heard that the University of Manchester has accepted the work which he has published from Coimbatore and that they propose to confer the degree of D.Sc. upon him."

ERRATUM TO G.O. No. 1949, REVENUE, DATED 26TH AUGUST 1915.

Paragraph 4—

For the words "have earned for him the degree of D.Sc. from the University of Leeds."

Read "have been recognised by the University of Manchester who propose to confer the degree of D.Sc. upon him."

REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE,

MADRAS PRESIDENCY

FOR THE OFFICIAL YEAR

1914-15.

MADRAS:
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

1915.

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OFFICE OF THE
DIRECTOR OF AGRICULTURE, MADRAS,

R.O.C. No. 455 B OF 15. *Dated* 1915.

ENCLOSURES.

From

D. T. CHADWICK, Esq., M.A., I.C.S.,
DIRECTOR OF AGRICULTURE,
Madras.

To

THE SECRETARY TO THE COMMISSIONER OF REVENUE
SETTLEMENT, SURVEY, LAND RECORDS AND
AGRICULTURE,
Madras.

SIR,

I have the honour to submit the annual report on the Agricultural Department for the year 1914–15.

I.—ADMINISTRATION.

A.—STAFF.

2. I was in charge of the office of the Director of Agriculture throughout the year and inspected all centres in which work was in progress except Tanjore and South Canara. I also attended the Planters' meeting at Bangalore, a subsequent meeting of their Executive Committee in Madras, a conference with the Educational Department on Nature study, the Cotton Conference at Delhi, a conference in Madras with representatives of the leading trading and agricultural interests of the Presidency, a discussion with the members of the Indian Committee on Co-operation, agricultural meetings at Tiruppur, Berhampur, Madurantakam and Koilpatti and was present at His Excellency the Governor's inspection of Taliparamba and Palur farms, besides being a witness before the Madras Survey Committee.

3. During Mr. Hilson's absence on six months' leave Mr. Thomas was in charge of the Northern Division with M.R.Ry. K. Ramasastrulu Nayudu as Assistant Director. Mr. Sampson was single-handed in the south. M.R.Ry. D. Ananda Rao was posted as Assistant Principal to Coimbatore and during Dr. Barber's absence on leave M.R.Ry. T. S. Venkataraama Ayyar held charge of his office. A Personal Assistant has been posted to the Head Office, for which I am grateful. Rao Bahadur M.R.Ry. J. Dharmaranga Razu was appointed but unfortunately died before he could join and his place was taken by M.R.Ry. V. S. Asvatha Ayyar. Mr. Mehta's services were dispensed with on the termination of his probationary period at the close of the year. Otherwise there were no changes in the gazetted staff. The organization of the college has been further regularised by the formal constitution of a College Board.

4. The year closed with six vacancies in a sanctioned subordinate staff in the districts of 51. Some of these have been filled subsequently. Special arrangements were made during the year to depute an Assistant Farm Manager to the

Parlakimedi Estate Farm. Men were transferred as little as possible and as junior men are beginning to relieve the seniors of much of the farm work it is possible to keep the latter more continuously on district work. The generally excellent effect of this will be seen in the section below which deals with district work for which concentration, continuity and friendly relations with the local ryots are indispensable. Towards the close of the year information was received that the Secretary of State had accepted the proposals for the expansion of the department. These provide for seven divisions in the districts, the establishment of more district farms, the recruitment of a trained district staff in every district, the co-ordination of the prospects of assistants in the scientific sections with those of men in the districts and a general improvement in the pay and prospects of most of the men in the service. The department thus possesses for the first time an ordered scheme along which development can take place.

5. Mr. Coventry, C.I.E., the Agricultural Adviser to the Government of India, inspected Coimbatore and also the farms in the south and west in February. He appeared to be well satisfied on the whole with what he saw and his report is with Government. Five gazetted officers from other provinces came on tours of inspection in the year to different parts of the Presidency.

B.—Buildings and Laying out of Farms.

6. No new farms were opened during the year, but an additional area was added on lease to Samalkota, and a stretch of waste sand dunes was added to Hagari. The buildings at Anakapalli were completed and have been very well designed and arranged by the Farm Manager. Most of those at Sirvel were finished and both farms were put into order. Both however suffered, Anakapalli from a flood and a cyclone, Sirvel from a breach in the Kurnool Cuddapah canal which effectively cut off all supplies of water. The ginnery at Hagari was not finished in the year.

7. As regards Coimbatore, it is satisfactory to say that the difficulty of the water-supply has been solved at least for the present by fixing an engine to another well and reserving it for drinking and household purposes. Sanction has been obtained for the following works, the construction of rooms for forty more students, quarters for the Lecturing Botanist and nineteen more houses for the employé's at the College. The site for the Rest House for Indian visitors, and dispensary, etc., has been acquired but the buildings have not yet been started.

II.—AGRICULTURAL EDUCATION.

8. The year was noticeable for the introduction on June 7th of the new scheme sanctioned in G.O. No. 2381, Revenue, dated 17th August 1914. By this, instruction in the first two years is devoted mainly to general agriculture and its allied occupations, *e.g.*, the dairy, cattle feeding and rearing, care of implements, etc.,—the lectures in both scientific and agricultural subjects being fitted in with the general scheme of practical work. It is possible to take in 40 students a year for this course. Those who wish to prosecute their studies further may be taken for an additional 18 months' course devoted mainly to the sciences as applied to agriculture. About 100 applications were received and just as in previous years a week's preliminary examination at Coimbatore was held to pick out the most promising students. The result was that 42 were admitted. The year thus opened with a total strength of 74 in the College and closed with 70 still in residence. Stimulated undoubtedly to some extent by the publication of the scheme for the development of the department there have been 200 applications for the 40 seats in 1915. This competition for admission to the College is an encouraging feature in this agricultural work. It promises to give a wider scope of selection for the department, in itself a great advantage, and it means that a start has been made in getting hold of the younger generation. Very great progress has been made in district work in persuading the working ryot to adopt improvements, etc., but this annual small stream of boys from the College means that more and more of the sons of the middle class landholders are obtaining a knowledge of agricultural principles and practice which they could not otherwise get. If this only grows

and increases, it should have in time considerable economic effect in the districts. Practically all the students who leave Coimbatore become members of the Madras Agricultural Students' Union which is doing most excellent work in keeping the old boys together as members of a corporate body. Without such a bond of union those who do not join the department are apt to get lost in the districts. The Union has changed its magazine from a quarterly to a monthly one. Most of the work connected with the Union naturally falls on the Assistants at Coimbatore and though it is often heavy it is ungrudgingly performed. Founder's Day was kept as usual as an Old Boys' Day, this time under the Presidency of the Hon'ble Mr. Ll.E. Buckley. The Hostel has continued to work satisfactorily under the Warden. With the increase of students it has been necessary to appoint a steward paid out of Hostel funds. The services of a retired Taluk Head Accountant have been obtained. The tone of the College throughout the year has been uniformly good. The work of a Principal of a College may not at times appear to be so showy as that of a District Officer who can point to the sales of so many thousands of pounds of seed, etc., but the department knows that it is the labours of Mr. Wood and of the whole College staff that make these other things possible.

9. All the third year students (15) got through their examinations but the general standard was low. They were not as good as the year which preceded them or as the one that is following on promises to be. They were weakest in Agricultural Engineering. The post of Engineering instructor is the one which it is always the most difficult to fill satisfactorily. As usual the students in the third year were taken on two tours—one to Kistna and Gōdāvari and the other to Madura and Tinnevelly. These tours are of the greatest instructional value. The second year students were examined in Chemistry, Botany, Mycology and Entomology by examiners from other Provinces. They did very well, especially in Chemistry—credit for which is mainly due to the careful teaching of M.R.Ry. Ramaswami Sivan.

III.—RESEARCH AND EXPERIMENTS.

A.—Agriculture.

10. An attempt is made below to collect most of the important or interesting results obtained from the work on the agricultural stations and to indicate the main lines of work there in progress. For greater details reference is solicited to the reports of the different stations. The farms had their full share of the vicissitudes of the season. Anakapalle had six feet of water over it as a result of a breach in the river embankment and consequently some of the buildings were damaged and some fields scoured. After a prolonged shortage of rain Coimbatore suddenly got 3 inches of rain in one night in February when, as a rule, they rarely get 1 inch in the first three months of the year. The green manure crop at Sirvel did very well and the succeeding paddy was most promising when the Kurnool-Cuddapah canal breached and there was no more water. The whole crop died. This was most unfortunate as it was the first year of the farm and the demonstration promised to be most successful. Alike in Bellary and Kurnool the south-west monsoon was good but the north-eastern rains were poor, so that the early-sown crops did well but the late sown ones, *e.g.*, cotton and sorghum, did poorly. A farmer always dilates on the occasions on which the season has not behaved exactly as he thought it ought to have done; and in spite of this list of irregularities some very good crops and useful results were obtained.

Crops —(a) Sugarcane.

11. *Varieties and cultural methods.*—This section deals only with the work on the district farms. Dr. Barber's work is dealt with separately whilst the missionary work in the districts falls under the heading of Demonstration, etc. It was due to the presence of the red-rot disease in Gōdāvari that the first district farm was ever started, viz., at Samalkota. The great achievement there was the discovery of a cane very much more immune to this disease than the local variety, viz., Red Mauritius. But even so there is still some red-rot about. The last three years' work at Samalkota has clearly shown that the loss from this disease may be

entirely prevented by the exercise of a little care. There the practice is to harvest the canes clump by clump and tie together all those from one clump. As the canes are cut they are carefully looked over and any setts cracked or bored or with broken buds are discarded, and if there is any sign of disease in any cane from a clump no setts whatever are taken from the canes of that clump for planting next year. The results have been as follows: out of 18,000 clumps which were grown in 1912–13 only 70 subsequently showed any traces of disease, in 1913–14 out of 38,500 clumps only 838 and in 1914-15 out of 32,200 only 175 or taking the three years together the incidence of the disease is only $1\frac{1}{4}$ per cent—a very different state of affairs from the time when the area under sugarcane in Gōdāvari was rapidly decreasing because the majority of the clumps were so badly diseased that the cultivation of cane more often resulted in loss than gain. Among the varieties tested at Samalkota B. 3412 for the second year in succession topped the list in yield of raw sugar per acre with $8\frac{1}{3}$ tons. Java 247 again came second. On the average of the last three years the positions of these two are reversed but if B. 3412 maintains its position this year it will be put out in the district. For the conditions in Vizagapatam on the other hand B. 1529 appears to be suitable—a cane which is steadily improving its relative position at Samalkota but as yet has only reached fourth place there. Much reliance however cannot be placed upon the Anakapalle results this year as the farm was first flooded and later many of the canes were laid low by a cyclone. At Nellikuppam Messrs. Parry & Co. are testing most of our varieties of cane on field scale and under factory conditions. These results are not yet to hand.

12. *Manurial*:—Sugarcane is one of the most paying of crops and requires intensive cultivation. Questions therefore connected with its manuring are of importance. A series of experiments tried some time ago showed that on the delta land of Samalkota artificials were not so profitable as oilcakes, and for the last three years different oilcakes, viz., safflower, pungam, gingelly, groundnut and castor have been tried against each other. So far as any inference can be drawn from these results as yet it would appear that none of these possesses any peculiar virtue over its competitors, the controlling factor in the nett profits is the price at which these cakes can be obtained at the time of purchase provided about 120 lbs. of nitrogen is given per acre. There is, if anything, a slight advantage in gingelly cake unless the price rises very high.

(*b*) *Paddy.*

13. In future most of the work on evolving single strains of better paddies will be undertaken by the Economic Botanist, the work on district farms being more concerned with local cultural and manurial problems. Where a sufficiency of water is obtainable it is the practice in the south of the Presidency for one paddy crop to follow the other without any interval. In Gōdāvari on the other hand the main crop is harvested in November-December and the second crop is not sown till the end of January or more often in February although throughout January there is always ample water. And this persists although there is from time to time a shortage of water at the end of the second crop season. If the successful cultivation of paddy merely depended on the presence of water here was a great opportunity for finding a crop which would repay sowing in late December or early January and so save a month's water-supply. But water is only one factor, albeit a great one, in the growing of paddy. For six years since 1908–09 trials have been made with all sorts of paddies to find one which will stand these conditions in Gōdāvari, but without avail. Only occasionally was a harvest got which was worth recording. This emphasizes the fact that with paddy as with other grains there is a proper seed time for each locality.

14. *Seedlings: Thin Seed-beds.*—In trying economic transplantation of paddy which is so widely advocated by the department the mistake is often made of not reducing the amount of seed sown in the seed-bed. If a healthy stand of plant is required, as it is, it stands to reason that strong healthy seedlings should be grown. It has been shown again and again by experience that seedlings from a thick seed-bed do not do so well when transplanted singly as seedlings from a thinly sown seed-bed, but

there have been no comparative figures. Experiments have been made on this for the last three years at Samalkota and the results are uniform each year. The usual local thick seed-beds are sown at the rate of 700 lbs. of seed to the acre. Seed-beds have been sown at rates of 350 lbs., 280 lbs. and 210 lbs. per acre respectively for the last three years. The average yields of the resultant crops have been 3,513, 3,648, 4,066 lbs. of grain per acre and 6,438, 6,525, 6,493 lbs. of straw per acre. There is thus nothing in it in the yields of straw whilst the yields of grain are definitely and in every case in every year in favour of the thinly sown seed-bed. This experiment will not be continued.

15. *Age of seedlings at transplantation.*—The usual proverb is that seedlings should be in the seed-bed for as many days as the weeks the crop subsequently remains in the field. For six years experiments have been conducted at Samalkota to determine whether the age of the seedling at time of transplantation is of vital importance to the subsequent crop. A crop was taken in which 35 days is the normal age of seedlings at transplantation and each year seedlings aged 25 days, 35 days and 45 days have been transplanted. It is clear that this experiment could be put down in two ways; either the seedlings could be sown at intervals of ten days and all the seedlings transplanted the same day or the seed-beds could all be prepared on the same day and the seedlings be transplanted at intervals of ten days. Both have been done. The figures show that the age of the seedling within these limits is practically unimportant where transplantation takes place on the same day, but where the dates of transplantation differ the advantage rests with the crop transplanted earliest although the seedlings used are youngest.

The average figures are: —

Age of seedlings.

	25 days.	35 days.	45 days.	
Transplanted the same day ...	3,198	3,192	3,244	lb. per acre.
Transplanted at intervals of ten days Seed-bed sown the same day	3,841	3,638	3,735	

It is probable that more care was taken with this experiment in the later years and if the figures for 1909–10—which are at variance with all those of subsequent years—be omitted the figures in the last line would read 4,048 3,757 3,674. The inference is that the age of the seedlings is immaterial between 25 and 45 days provided transplantation takes place early. This experiment will be discontinued in this form.

16. *Manurial experiments.*—At Samalkota, Coimbatore and Manganallur experiments are in progress testing the effects of different manures on paddy. On the first two farms this work has been in progress much longer than at Manganallur. Manurial requirements of course, differ with the locality although a long series of experiments in the west have shown that not infrequently one particular manurial constituent, exercises a great effect as a rule on a particular crop. In considering the results of experiments carried out under such different conditions as exist in Coimbatore, Tanjore delta and Gōdāvari delta exact uniformity must not be expected. But there is an increasing mass of evidence that the generally most suitable manure for paddy is green leaf in some form (or bulky organic nitrogenous matter) supplemented by phosphate in some form. Whether the addition of the latter is financially profitable at any particular place depends on local trials there. Evidence is however accumulating from many different sources as to the correctness of the main proposition. Isolated experiments in Kistna Western delta also tend to confirm it. Potash rarely has a beneficial effect. The average of over six years' comparative trials at Samalkota shows 2,585 lbs. per acre on the no manure plot, 2,749 lbs. on that which receives only green leaf, 2,736 on that which gets green leaf *plus* potash and 3,340 on that which has a small application of superphosphate in addition to green leaf. Corresponding average figures at Coimbatore for a like period give 3,114 lbs. 3,291 lbs. 3,175 lbs. and 3,343 lbs. It is doubtful whether the addition of the phosphate to the green leaf pays at Coimbatore. Figures of cost and profit will be worked out for

Samalkota. At Manganallur, the corresponding figures for this year alone are 1,700 lbs. 1,925 lbs. 2,240 lbs. and 2370 lbs. respectively. The results of more years' work there is however needed before anything definite can be said. The fringe of this work has of course only been touched, though the problem has been greatly cleared by the fact that time need not be spent on trials with potash and many of the mineral combinations in which nitrogen occurs. Experiments have been started at Manganallur to determine the form in which phosphate can be most advantageously applied. So far as they have gone they tend to show that although paddy is grown under swamp conditions phosphate in the form of super is more readily available to the plant than mineral phosphates or bone meal. The time and method of application is also of importance. Mr. Sampson writes in regard to the Manganallur experiments: "It is evident from observation of the growth of the crops especially in the case of superphosphate that these manures have a decidedly stimulating effect; not only do the crops become established sooner but they assume a more healthy and vigorous appearance than is apparent from the difference in crop yield and it is probable that a second application during crop growth would have a greater influence on grain production." This has to be tested.

17. *Increase of straw to increase of grain.*—The complaint is sometimes made that the application of artificial fertilisers causes an undue increase in the quantity of straw at the expense of the grain. This has not been the experience at the farms with the use of superphosphate in moderate quantities. Thus the figures at Manganallur gave as percentages of grain yield to straw yield on the no manure plots 71 per cent. and 64 per cent. and on those on which super had been added 81 per cent. and 64 per cent. Where super was given in addition to leaf the percentages of grain to straw on the plots which received leaf alone were 83 per cent. and 98 per cent. and on those which received leaf *plus* super in moderate quantities (120 lbs. to the acre) 83 per cent. and 105 per cent. When the dose of super was doubled (*i.e.*, 240 lbs an acre) straw did increase more rapidly than the grain yield. The figures at Coimbatore corroborate this.

(*c*) *Cotton.*

18. Selection of single plant strains is being continued at Koilpatti, Hagari and Nandyal; and in the former district those which are considered to be the best are grown on 2½ acre blocks to provide sufficient lint for spinning tests. We are again indebted to Messrs. Harvey & Co: for doing these and their reports have been most favourable showing that these strains spin up to forty's and are strong and uniform. Another testimony to the value of these strains is shown by the fact that the Sri Chidambara Vinayakar mills at Koilpatti are paying a bonus of Rs. 2 to 3 per 250 lbs. of lint to villagers in order to procure the crop. Two of the strains put out in the villages disappointed expectations. Their quality and ginning percentage were maintained but the yield was only average. When young they carried a profusion of bolls and a very heavy yield was anticipated. But later many of these bolls were shed. It is not clear whether this was due to late rains in the season or not. In the previous year they had yielded very heavily. Both at Hagari and Nandyal a series of single plant selections are being very carefully tested. The seed which is being put out in both these districts is derived from single plants and some of the later selections on the farms promise to do still better. Selection work on Cambodia is in progress at Koilpatti and Coimbatore.

(*d*) *Dry Grains.*

19. The extent to which work is in progress on dry grains and fodder crops is possibly not realized, but detailed work is in progress on sorghum, the millets, ragi, chillies, and "dry" paddy besides many fodder crops The profits obtainable per acre from these crops cannot compare with those won from paddy, sugarcane and cotton, etc., and consequently elaborate experiments on manuring for instance are out of place; nor do questions of quality arise in regard to these grains to the extent that they do in cotton lint for instance. The chief lines upon which improvement can be found are therefore necessarily more confined to cultural methods, seed selection and prevention of disease. Under the first head come a

whole series of experiments, e.g., the most profitable rotation of crops in the different tracts, the use of the drill and harrow, the use of light iron ploughs on garden soils, the best method of applying water to ragi, etc. Also work on all dry land crops is not under the same control as that on paddy. The whole year's work may be lost through a vagary of the season. Cases of this will be found below.

20. Under the first of these heads, viz., rotation of crops comes the systematic cultivation of the waste lands of North Malabar. Chillies did especially well this year and some of the varieties yielded at Taliparamba a profit of Rs. 170 to Rs. 200 an acre. The hot weather rains were short and so ragi was caught by the monsoon before it was well established, The depression in the prices of ginger and turmeric also unfortunately continued and neutralized the effect of good yields. At Palur, Nandyal and Hagari rotation experiments are in progress, but of course the heavy fall in the price of groundnut and cotton has affected these series of trials which are to be judged by financial results as well as by the maintenance of the fertility of the soil. At Nandyal the rotation of a mixed crop of horse gram and cotton—a common local practice—followed by sorghum has been tested for six years against the simple rotation of pure cotton, sorghum. The only thing to be said for it is that thereby some horse gram for cattle food is obtained cheaply. The gram has no effect on the following sorghum crop nor apparently much on the cotton crop. This experiment is being discontinued and other rotations tested.

In Palur, the work of testing the best cereal to be grown mixed or in rotation with groundnut was continued.

21. Under the same head of cultural experiments come the deep cultivation before the hot weather of land on which dry paddy is to be sown, and the relative value of sowing ragi in flat beds or on ridges and furrows. The results so far as they go are in favour of deep cultivation for dry paddies early in the season. In the second case the experiments at Hagari which were continued go to show that the ridge and furrow system of planting is neither better nor more economical of water than the ordinary flat system in the case of ragi. This is somewhat at variance with the experience at Coimbatore and it would appear that the yields are about the same in both systems but that the quantity of water used depends on the care with which the land is laid out in the first instance. Also trials show that no economical results of value are to be expected from reducing the seed rate of ragi and chillies. Irrigated or Chitrai Cholam is one of the most important crops grown under wells in Coimbatore district, the profits from which mainly depend on the amount of water which has to be baled to mature the crop. Economy of water is thus most important. Attempts have been made for several years at Coimbatore to see whether this could not be achieved by growing the crop in ridges and furrows instead of on flat beds. This cholam however needs an irrigation to cause it to sprout; and a difficulty has always been found in getting an even start for the crop before it is big enough to earth up.

22. *Seed selection and varieties—Sorghum.*—At Hagari plots were again sown to test the yields of the six single plant selections, but no results were obtained as throughout the whole of that tract of Bellary the sorghum crop failed. It is these kinds of vicissitudes which make work on dry grain crops so much longer than on crops on which conditions are more under control. However one very useful piece of work was completed by Mr. Hilson on this crop. There are two main varieties of very different value from the point of view of fodder, one possessing a pithy stalk and the other a sweet one. Yet when the ryots sow seed which they expect is going to give them sweet stalked fodder, a large number of these pithy stalked ones always appear. Careful experiments at Hagari and Nandyal have shown that cross fertilization of sorghum readily occurs in the field and that this composition of the stalks is a simple Mendelian characteristic in which sweetness is recessive. It is thus simple in future to obtain a pure strain for sweetness of fodder; it is necessary to get a good grain yield on it also.

23. *Ragi, Italian millet and Cumbu.*—The testing of different single strains of ragi was continued at Hagari with good promise, whilst the season there also favoured Italian millet which gave a record yield. It failed completely in the previous year. It has also again done well at Coimbatore. The grain of one of

the foreign varieties of cumbu is beginning to find favour in the neighbourhood of Coimbatore. Work is being continued thereon.

(e) *Fodder Crops and Grasses.*

24. *Foreign varieties.*—These fodder crops and grasses are becoming more and more important every year as all improvement of cattle is closely bound up with the provision of good and cheap fodder. The best comparative tests can be made at Coimbatore where there is a herd of cattle. The standard fodder crop of the district is cholam, periamanjal, sown thickly and grown under irrigation. But the recent experience at Coimbatore goes to show that guinea grass would be more profitable to grow for this purpose. The former gives per acre from 25,000 to 33,000 lbs. of green fodder whilst guinea grass gives from 22,000 to 36,000 lbs. and is more economical to grow and has not so much waste. Silver Beet or Swiss chord mentioned last year has again done well on the whole giving 25,000 lbs. in six cuttings between October and April. Teff grass was also again grown and made into hay. It was of good quality but the yield—1 ton an acre—is not very good. At Koilpatti the local irungu cholam usually grown for fodder has been entirely superseded by periamanjal introduced from Coimbatore and there have been considerable sales of it to ryots in the district.

25. *Indigenous grasses.*—There is reason to believe that the natural supply of many of the most valuable indigenous fodder grasses of India has been grievously diminished by the practice of unrestricted grazing. Cattle turned on to a pasture naturally eat the more succulent grasses first, so that in places where cattle in considerable numbers always wander over the grounds as soon as a flush of grass comes year by year, the better grasses have less chance of maturing and spreading. The inferior grasses are encouraged to spread at the expense of the better. The obvious remedy is to devise some scheme for sowing seed of better grasses and for protecting the pasture till growth is established. But no one has ever done any work on Madras grasses from an economical point of view. So this department is not yet in a position to distribute seed. In most of the papers of earlier years, *Pennisetum cenchroides*—the far-famed grass of the Kangayam country—is mentioned as if it would flourish everywhere, which of course is not the case; or the exotic *Paspalum dilatatum* is recommended. This last is growing admirably in the lower portions of Sim's Park, Coonoor, but does not flourish on the dry-arid plains. A start has been made to collect all the local grasses which are held in greatest estimation by the ordinary local herdsmen and they will be tried and tested. A comparative plot of some of these were laid down at Hagari last year. Of a cognate nature is the keeping of correct and careful accounts to find the cost of converting 200 acres of bare sand dunes into useful and profitable pasture. This has been started.

(f) *Groundnut.*

26. *Varieties.*—Tests were continued to compare the value of 13 different kinds of groundnut. West African continues to maintain its place as the best nut on unirrigated land having given an average yield for the last three years of 505 lbs. of oil per acre; but on land irrigated from wells local Mauritius is still ahead with an average of 950 lbs. West African coming third with 877 lbs.

(g) *Pepper.*

27. The year on the West Coast was altogether peculiar. There was practically a seven months' drought from October 1913 to May 1914 as only 1·56″ of rain were received instead of the average 8·35″. The result was that many of the vines died and all, except those in the most sheltered corners, suffered from lack of shade in the hot weather. On the other hand there was almost an entire absence of the usual disease "pollu," and the final result on the whole was a record yield of pepper from the farm, viz., 4,741 Madras measures of green pepper (practically 4,741 lbs. of dry pepper); but the yields varied so much according as to the amount of shade received in May that for the comparative purposes the results

from the different plots are of little value. Of the varieties Kallavalli continued to improve its position as the heaviest yielder.

(*h*) *Live Stock.*

28. *Cattle.*—The first attempts to obtain a special officer for cattle failed and the only herd maintained by the department is the one at Coimbatore. It did well throughout the year. There were 34 births, 26 animals were bought, 42 were sold and 3 calves died. At the end of the year the herd, including working bullocks, numbered 205, of which 37 were cows and 6 heifers. Many of the heifers born on the estate are now coming to maturity, but it is slow work. The dairy dealt with 79,300 lbs. of milk as compared with 66,900 last year, and besides sales of fresh milk 1,886 lbs. of butter were sold as compared to 1,358 lbs. last year. Debiting the milk used by the dairy at 1 anna a pound and allowing for depreciation, establishment, etc., there is a small profit on the year's working. The average yield of milk of the whole herd, including the dry cows, only works out to approximately $3\frac{1}{2}$ lbs. of milk a day. This valued at 1 anna a pound comes to Rs. $6\frac{1}{2}$ a month per cow which is certainly more than the cost of its keep. But a much higher average daily yield of milk is required.

29. *Sheep.*—The flock at Hagari continued to do well and at the end of the year had increased from 36 to 58. Unfortunately the shepherd in charge failed to note several of the matings and consequently the male parentage of some of the last born lambs is not known. There are two rams with the flock. The average clip of wool has not improved as much as was hoped being only $1\frac{1}{4}$ lbs. though one animal for the second year in succession gave over 3 lbs. An interesting trial was made to see whether it would pay to buy young lambs and fatten them on some of the fodder crops for the Bellary market. Those purchased were a mixed lot of lambs, none of which had been done well from birth and they did not grow as well as was expected, with the result that when the growing of the crop was taken into account the balance on the profit side was only the manure. Mr. Hilson believes that better results ought to be obtainable and is repeating the trial with some of the farm-bred hoggs.

B.—Chemistry.

30. The soil survey of the delta portion of Guntūr district was completed and it is expected that the final maps will be ready in a short time. Two thousand four hundred and twenty-seven analyses were made of different products of which 53 were for cultivators. Mr. Harrison continued his work on the gases in paddy soil during the growing period of the crop and another memoir on it was accepted by Pusa and published. It appears that the gases mainly given off by the decomposition of organic matter in paddy soils react with the organized film of diatoms on the surface of the water of the field, promoting the oxygenation of the surrounding water and therefore with a slow rate of drainage improving the aeration of the roots. A long series of experiments also goes to show that gaseous nitrogen is evolved from paddy soils especially during the growing period of the crop. The general trend of all this work is that green manure crops have not so much direct manurial value on paddy as has been imagined but have a very important influence on the healthy growth of the crop by improving the aeration of the water and soil, by improving the mechanical texture of the soil and by promoting biological action. The investigation is being pursued. In conjunction with the Government Mycologist some bacterial work was done This is mentioned in the section on Mycology.

C.—Economic Botany.

31. Work on paddy occupied most of the attention of the Economic Botanist and his staff. It was the first year in which they had been able to raise crops from seed of known parentage, and the crops grown on the small plot of land on the Central Farm utilized as a breeding station were a revelation of the extraordinary variations which may occur in paddy. Looked at from the point

of view of an agriculturist, which is the all important one, two facts stood out. One was the extent to which the ordinary varieties in the ryots' fields are not really true to type, and therefore the difficulty of improving the crop by mere single plant selections. Even when these are made as carefully as possible for desirable characteristics from crops which were believed to be pure the odds are practically even that in the next season these selections will split up into plants revealing all sorts of combinations of characteristics instead of coming pure. The other fact was the importance from the point of view of yield of obtaining a pure strain in which all the plants come to maturity uniformly. A field must be harvested at one time, the grain cannot be plucked like cotton and plants which either mature before or after the majority are merely so much loss so far as the harvest of grain is concerned. Considerable attention was naturally given in the first year to the inheritance of morphological characteristics and a paper on some of these was contributed to the Indian Science Congress. Arrangements have been made to provide the Botanist with more uniform land on which to grow his selected seed. The wet land on the Central Farm is notoriously variable and when it comes to testing economic as distinct from purely morphological qualities it is essential that the conditions under which the plots are grown be uniform. Some 600 lots of paddy are being carried on, of which a third are for studying the inheritance of important economic characters. A beginning has been made of an economic survey of the paddies in the most important rice growing tracts of the Presidency. In cotton attention is being concentrated on Cambodia and Cambodia crosses. The Deputy Directors of the Northern and Southern ranges have already done considerable work on the local indigenous cottons and in this they will not be disturbed.

D.—General Botany.

32. Much of the work under this section comes under the head of teaching, but work in connection with the herbarium is always in progress, for which purpose tours were made in various parts of the Presidency. Some 2,000 specimens were collected in the year and 1,586 sheets added to the herbarium. Three thousand six hundred and sixty-four sheets had been sent to Mr. Gamble at Kew for his work on the Madras Flora before he wrote and asked that no more be sent for some little time and until the sea route was safer. In round figures he has received 10,500 sheets for his book on the Madras Flora. One hundred and eighty specimens were identified during the year for various correspondents.

E.—Entomology.

33. Mr. Bainbrigge Fletcher's book which was mentioned in last year's report was issued to the public and has been very favourably reviewed in journals both in India and abroad. I am also informed that there have been many private sales of it. As will be seen from Mr. Ballard's report (Appendix VI) the new Insectary has proved most useful in working out the life histories of several insect pests. In the districts preparations were made to try new methods against the Deccan grasshopper. The ryots do not take at all kindly to bagging the hoppers. Deep ploughing in order to destroy the egg masses is efficacious but it is difficult to get ryots to do this on a large scale, and unless all or the majority of the villagers work together against a pest those who have taken trouble have the mortification of seeing their crops destroyed by the insects which come from their neighbours' fields. Considerable success has attended campaigns against grasshoppers in the United States of America by the use of poisoned bait. The attractive principle for the Deccan grasshopper has however not yet been discovered. Mixtures of Paris green and jaggery flavoured with mango, lime and many other ingredients were all tried alike in vain. Fortunately the season was very unfavourable to this insect and the ryots' crops did not suffer much from its depredations. The use of light traps is often recommended as a remedy against schoenobius bipunctifer, the insect which causes the dead white head seen in paddy fields, but a prolonged trial with them showed that this remedy cannot really be relied upon. The most successful district work was done on Mr. Stevenson's mango gardens in Salem against the

mango hopper. The trees were treated periodically with fish oil soap made by the Fisheries Department, which promises to be a very useful and cheap insecticide and the crop was saved. Mr. Stevenson saw that instructions were faithfully carried out and he was fully satisfied with the results.

34. *Sericulture.*—The district work on sericulture is dealt with in a later section of this report. French seed of the univoltine species were obtained from the Salvation Army at Simla but neither at Coimbatore or Kollegal were cocoons successfully reared. At the Salvation Army Settlement at Bethupadi a few did come through and the resultant cocoons were much larger and heavier than those obtained from the ordinary multivoltine species. The partial success obtained at Bethupadi was not due to any special methods and precautions, but is useful in showing that these cocoons may live in Southern India and trials with them will be continued.

F.—Mycology.

35. In previous reports it has been customary to fill most of this paragraph with an account of the district work against the palmyra, coconut and areca palm diseases. That is really district work and in future will be dealt with in the section devoted thereto. In the West Indies a disease on coconut palms very similar in description to that found on the palmyras in Gōdāvari and the coconuts in Malabar is ascribed to a coliform bacillus. Coliform bacilli have been isolated from the rotting portions of palms in this country affected with budrot, but inoculations with pure cultures thereof on healthy palms have not induced the disease, whilst inoculations of healthy palms with pure cultures of the fungus Pythium palmivorum have resulted in all the symptoms of budrot with subsequent death. It is thus established that the cause of the disease known as budrot in Southern India is Dr. Butler's fungus Pythium palmivorum. A new disease has been reported on coconuts in Cochin and is under investigation. A fungus on paddy which converts the loose head of grain into a solid black diseased spike was worked out in detail and field operations against it will be tried next year. The cause of black rot in plantains has not so far been discovered. General correspondence is developing; thirty-six bundles of diseased plants were received for investigation and twenty-one applications of investigating diseases on crops were received.

G.—The Sugarcane Breeding Station.

36. Dr. Barber's report is published as Appendix VIII. The extraordinary differences in habit between the different seedling canes were mentioned in last year's report as well as the fact that the chemical analyses of the different seedlings promised great variations. The complete analysis of last year's seedlings shows that 61 of the Madras seedlings analysed at over 17 per cent. sucrose, 37 over 18 per cent., 8 over 19 per cent. and 2 over 20 per cent. These are all satisfactory figures for this one feature as will be seen by the fact that Red Mauritius, Java 247, Barbados 208, B. 1529 which are the best of the recently imported canes range between 16 per cent. and 20 per cent. Some 150 packages of cane have been sent to the stations in Northern India. Among these are nine Madras seedlings which have been distributed mainly in order to see how they fare in the north. It would appear that, in 1913–14, the seedlings were if anything treated too well on the station so that vegetative growth increased at the cost of sugar content, for when cuttings from them were planted on field conditions, an improvement in sucrose content took place concurrently with a fall in the general luxuriance of their growth. Hitherto one of the most difficult matters has been the collection of pollen which frequently has had to be brought from scattered and distant villages. However, this year by utilizing part of the wet lands at the Central Farm and at Taliparamba and Samalkota this difficulty has been much reduced. Dr. Coleman in Mysore has kindly helped once more. The North Indian canes which hitherto had never flowered did so this year but unfortunately did not set fertile pollen. Some 23,000 seedlings were successfully raised in the year. Dr. Barber and his staff contributed during the year several papers on their work and on sugarcane to Pusa, and the International Congress of Tropical Agriculture, etc.

H.—Pisciculture.

[Sir F. Nicholson, K.C.I.E., writes as follows.]

37. *Fresh water pisciculture.*—As in previous years this was in charge of Mr. H. C. Wilson. The Sunkesula fish farm was maintained, the breeding and distribution of larvicidal fish was developed, the Ipur fish-farm plan was sanctioned and its construction begun, several important tanks were stocked, the Nilgiri trout streams were duly conserved and their supplies of fish food replenished, the waters of the Bhawani and Moyar continued under conservation, the acclimatisation of tench in the plains was achieved, and the rivers of Coorg and South Canara carefully surveyed in view to further operations. There were numerous minor operations in progress, but the large Collair lake scheme is at a standstill by reason of the number of traps and fixed engines in the locality. Certain restrictive measures have been introduced and others were under investigation.

38. *Marine Pisciculture.*—This was confined in actual operation to the Tuticorin lagoon fish-farm of about 160 acres which was duly constructed and began work towards the end of the year, and to the edible oyster farm at Pulicat which continued to work successfully, though with vicissitudes due to floods and droughts. The pearl oyster farm near Pamban received the general sanction of Government in January 1915 and the matter now awaits the submission of detailed plans and estimates by the Public Works Department, and the acquisition of the island.

General.—The staff both for inland and marine pisciculture was considerably strengthened during the year and this will lead to developments hitherto impossible.

IV.—DEMONSTRATION, AID TO THE PUBLIC, SHOWS, AGRICULTURAL ASSOCIATIONS AND GENERAL PROGRESS.

39. The year has been marked by a general development of district work all round. In practically all lines there has been distinct advance.

(*a*) *Operations against disease.*

40. *Palmyra disease in Gōdāvari and Kistna.* It may be thought that this disease is doomed to be ever with us, but mention was made last year of a change in method. Not only were steps taken to cut dead and infected trees as soon as signs of infection were apparent but in one small tract of Kistna the villagers were persuaded to cut all trees within the known infected area searching for hidden signs of disease and where these were present to operate at once. This method has in the course of the year been pushed still further so that all infected tracts in all villages of Kistna have been so examined and a start has been made in Gōdāvari district. When it is remembered that 95 per cent. of the trees operated upon recover and that an infected tree can remain a source of infection to others for years it is clear that if this system of detailed examination can be generally introduced there will be a fair chance of overtaking this disease. The system by which the State supplies the supervision and driving power and the ryots do the work at their own cost is the ideal one for dealing with disease. Great credit is due to M.R.Ry. V. Ramanadhan, the Kistna Tahsildar and his staff for the work they had done there. In all 220,403 trees in the two districts were cut of which 33,553 were dead at the time of operation, 40,286 were trees with external signs of infection and 9,738 were infected trees showing no external symptoms. The remaining ones were healthy trees partially cut in the process of examination. These figures may be contrasted with those of previous years. The increase in the cost of staff has been comparatively small; yet in 1913–14 the figures were 100,741 trees cut (71,341 dead and 29,400 infected) and in the years previous to that about 80,000 a year all dead because no attempt was then made to deal with infection. At the end of the year 27 villages in Kistna were removed from the infected list.

Coconut disease in Malabar.—The same disease Pythium Palmivorum attacks coconuts in Malabar, but these palms are not nearly so susceptible to it as are palmyras. The disease is widespread, and not intense or virulent anywhere. 1,497 infected trees were destroyed.

41. *Mahali disease on arecanuts.*—Work was continued in South Malabar and in a remote corner of South Canara to demostrate the efficacy of spraying arecanuts with Bordeaux mixture as a preventive against mahali (Phytophthora). In all more than 29,000 trees were successfully treated as compared with 14,000 in 1913-1914 and 2,100 in 1912-1913 when field work was first started.

42. *Work against smut on cholam.*—In Bellary and Kurnool a definite attempt was made to persuade the ryots to steep their cholam seed in a 2 per cent. solution of copper-sulphate before sowing as a preventive against smut. They did it on seed sufficient to sow 1,300 acres but more work of this nature ought to have been done in Kurnool.

(b) Crops.

43. *Sugarcane.*—Work in connection with this crop is at present of peculiar interest because of the high prices ruling for sugar and jaggery. The current year should see a considerable expansion of this work especially in Vizagapatam district where a beginning was already made (*a*) by the distribution to the ryots of 45,700 setts of B. 1529, (*b*) by the sale to them of 16,400 lb. of castor cake for manurial purposes and (*c*) by getting them to use improved furnances of which two were erected. In South Canara, Red Mauritius is now established in 150 villages. It is however in very scattered portions. The total area under it is 424 acres as compared with 194 last year and 84 in the one previous to that whilst the use of iron crushing mills continues to spread. Six years ago they were unknown but since then some 130 have been sold. The cultivation of it is also reviving in Malabar under the stimulus of high prices. A start was made in introducing improved furnaces into Chittoor district which it is calculated means an average increased profit of Rs. 15 in converting each acre of cane into jaggery.

44. *Cotton.*—As before, work was confined to the Tinnevelly, Bellary, and Kurnool districts and in all progress resulted. In the south a new circle was opened for village work in the Rāmnād district. In Tinnevelly 400 acres were cultivated in October 1913 on seed farm by 61 contract growers besides another 95 acres sown with different unit strains to provide lint for spinning tests. From the seed farms 120,015 lbs. of good pure seed were obtained. Of this 103,465 lbs. were sold to ryots from seed depôts in the sowing season of 1914 at 20 per cent. above ordinary bazaar prices. This was sufficient for 12,170 acres. The figure for the previous year was 89,500 lbs. seed sold sufficient for 10,500 acres. In 1913-14 three villages took the produce grown from departmental seed direct to the ginning firms without intervention of middlemen and obtained their own seed back pure. In 1914-15 twenty villages so took 132,750 lb. of kappas and obtained 97,500 lbs. of pure seed. Most of this was kept for sowing purposes and was certainly sufficient for another 10,500 acres in October 1914. Therefore in the season of 1914-15 there were from 20,000 to 22,000 acres under departmental seed more than double the area obtained in the previous year. By this joint sale it is calculated that the ryots made an additional *Re.* 1-2 per acre (or very nearly their assessment) independently of any profits they made by selling their surplus seed for sowing for which there was a good demand. There are obviously very great possibilities in this system of joint-sale both as a means of profit for the cultivator and as a means of spreading new types. But it has not been possible yet to form thoroughly operative co-operative societies as matters of finance have not been arranged. If the smaller producer is to obtain the benefits of this joint sale he must be able to get advances against his growing crop; otherwise he has recourse to the middlemen and all chances of his joining in joint sales after harvest disappear. This has to be arranged because not only have all the firms in the trade now agreed to gin such joint consignments separately from those of any one else but one mill is offering higher prices to obtain the lint from our departmental seed. One of the special strains put out last year in the south of the district did very well, but unfortunately the one around Virudupatti shed many of its bolls late in the season and the yield was affected. In Bellary 693 acres were sown on seed farm conditions and 58,253 lbs. of good seed was obtained. 51,943 lbs. (sufficient for 7,000 acres) were sold at 15 per cent. above

local prices of seed. In Kurnool from 651 acres of seed farm 43,702 lbs. of seed were obtained of which 30,736 lbs. were sold. In Bellary all the seed sown was of unit strain and in Kurnool most of the seed sold was from a single plant selection. This year all will be. The total area under seed farm conditions in October 1914 was 2,250 acres in the three districts, and altogether 186,144 lbs. of seed were sold sufficient for 21,900 acres. If to these two acreages be added the area sown with seed retained by joint sale in Tinnevelly, 34,000 acres are this year to our knowledge under seed of selected varieties. In the previous year the area under this known seed was 14,600 acres, so a very considerable development has taken place. The budget allotment was Rs. 46,350, actual payments were Rs. 46,390, and receipts Rs. 41,257. In these figures also come the expense in spreading drill cultivation in Tinnevelly (v. below); also at the latter part of the season there was a very heavy fall in the price of cotton due to the outbreak of war. It has on the whole been a very satisfactory year's work.

45. *Drill cultivation in Tinnevelly.*—Concurrently with the work on cotton the use of the drill and harrow is being introduced into Tinnevelly. Hitherto coolies were largely trained in the use of these implements on the Koilpatti farm and as a result most of them were drawn from the labouring classes. But as a result of better organization arrangements were made in Tinnevelly to give more training in the villages and as a result many of the sons of the more respectable farmers are learning how to use these implements. The area on which they were used by the ryots themselves shows a great increase, *viz.*, 11,329 acres, as compared with 7,117 in 1913–14 and 3,877 in 1912–13. 32 sets of implements were sold as compared with 35 in 1913–14 and 14 in 1912–13. Sales would probably have been greater still but owing to the fall in price in cotton on account of the war about September, October, there is tightness in money. The drill is being more and more used by ryots for the cumbu crop, and it is a mistake to look on this improvement in method of cultivation as one solely for the benefit of cotton. Cleaner and more careful cultivation of the soil benefits every crop grown upon that land. Moreover the figures given above include the area on which cumbu was sown with the drill and the soil was afterwards inter-cultivated. In 1910–11 these implements were only used on 70 acres of cumbu but in 1914–15 they were used by ryots on 1,990 acres.

46. *Paddy—Seed and seed-rate.*—There continues to be a very strong demand in the neighbourhood of all the farms for the surplus seed which is always sold slightly above ordinary market rates. Figures are not ready for the Southern division but in the Northern and Central divisions 63,124 lbs. of seed were sold; and the village associations which in Malabar are doing good work bought up most of that available from Taliparamba. The practice of reducing the seed-rate continues to spread and single seedling transplantation has spread very considerably in the Bhavani valley and has been started under the Amaravati irrigation. A general reduction in the seed rate is in progress around Samalkota and surplus seedlings from the Anakapalli farm were distributed to 48 of the ryots of the neighbourhood to be transplanted singly on their lands for demonstrational purposes. Only from one part of the whole Presidency is any complaint about this system heard and that is from portions of Shiyali and Mayavaram Taluks. Detailed district work was started there on these lines some four or five years ago and then on account of the opening of new farms the man had to be taken away. Had he remained it is doubtful if even this complaint had been heard. Some there say that they had excellent yields from these single seedlings for the first three years and then the fertility of the land appeared to become affected, and they are now transplanting in twos and threes. Even if they find that this system pays them best in the long run (although it is notorious that the Tanjore ryots do not manure their fields to the extent that the Tinnevelly or Coimbatore men do, and although Kistna which for years and years has practically used nothing but single seedlings has no such complaint to make) there is still a large reserve of credit due in Shiyali and Mayavaram to the introduction of this system of economic transplantation, for transplanting with twos and threes means that from 50–60 lbs. of seed are being used per acre, whilst in the old original system about 120 lbs.

of seed were commonly used. So that even now there is a saving of at least Rs. 2 an acre. In this connection an interesting fact has occurred. It has been possible this year to post a man once more for district work in these two taluks and he has sold 30,327 lbs. of green manure seed (Kolinji) much more than was anticipated. Thus it is not unreasonable to conclude that had it been possible to keep a man for district work there for the last four years continuously any real difficulty which was being felt by the ryots would have been met. In all this work the importance of preparing the seed bed carefully in the first instance and sowing it thinly must be borne in mind. (v. para. 14 *supra*). Strong healthy well developed seedlings are required and not the puny produce of a congested area.

47. *Manures.*—In the previous year small quantities of fish manure were sold to many ryots in the Southern Division for trial and as a result many more orders were booked for it in the year under report at enhanced rates, but unfortunately it could not be supplied as the catch of fish in the West Coast was a complete failure. Attempts are being made in the current year to get ryots to try small applications of superphosphate to supplement the green manure in accordance with the results on the farms (v. para. 16 *supra*). As a result of the Trade Conference of last December manure depots will probably be established in time. In all these matters of artificials it is above all things important that the ryot only gets the substance he requires and gets it pure.

48. *Green manure.*—The most rapid advance made has possibly been in the Musiri and Perambalur taluks of Trichinopoly district where work was begun (though the staff was very short) at the request of the Collector Mr. Buckley as the rates for leaves from the forest had been raised. Over 1,000 acres were grown with daincha in these two taluks and the growth was so good that often the crop from one acre was cut and distributed over two or three acres. Moreover which is still more satisfactory the ryots made arrangements to keep some of their crop for seed for the next year. In Sholavandan circle equal if not better results were obtained, and one village there estimated the value of the improvement as worth to them Rs. 20 an acre. This is not impossible when it is remembered that in that village daincha only costs them about Rs. 5 to 4 per acre to grow whilst previously they had been getting green leaf from the forests in Ariyalur in Trichinopoly district. The leaf had to be purchased, brought, from the forests to the railway station, trained to Sholavandan and then carted and spread upon the fields. Daincha continues to give much better results on land inclined to salinity than a good sweet land. This is probably due to its effect on the mechanical texture of the soil. In Madura circle work has not progressed so well as in Sholavandan mainly because the area was larger and there was a change of officers. Instances also were not wanting of the disappointments which at times result from working with agents of absentee landlords. There is no doubt about the sympathy and good intentions of the landlords but most of them are busy men, and among agents, there are agents and agents. It is obvious that some will not look with favour on a new fangled system which requires a little care and only costs about Rs. 3 to 4 an acre most of which goes in labour, in place of one which involves direct purchase. Daincha seed is still purchased from Bengal. In Malabar the absence of rain in April-May (1″ as compared to an average of 8″) affected adversely the cowpeas which are there being introduced for green manure. Daincha is getting a start around Mangalore. In Chingleput and South Arcot the work also developed. Taken as a whole the sales in the year amounted to 150,814 lbs. of seed (Southern Division 82,823 lb., Central 61,458 lbs. and the Northern 6,533 lbs.) as compared with 158,600 lbs. in 1913–14 and 60,800 lbs. in 1912–13).

49. *Indigo.*—As soon as it became probable that the European war would not suddenly collapse it seemed likely that the ryots who cultivated indigo this year would make great profits, and it was also likely that the price of indigo seed would rise rapidly. A special grant was therefore obtained from Government and a stock of good indigo seed was laid in before prices rose very high. Afterwards 24,570 lbs. of good indigo seed were sold in villages in which old vats still existed

in a state of fair repair, but in which latterly the trade in it had decreased. Later in the year prices of seed more than doubled and much adulteration took place. There were no complaints against the seed sold by the department and very many applications had to be rejected because stocks were exhausted.

50. *Intensive dry cultivation in Malabar.*—In spite of the fall in the price of ginger and turmeric which were the two chief commercial crops in the rotation recommended for these lands this system is steadily spreading. Amongst other things the residual effects of the manures applied to these crops have a great effect on the cereal in the rotation so that instead of modan paddy only being a catch crop, it has given to many ryots yields comparable with those of paddy on wet lands. Also over 10,000 chilli seedlings were sold from Taliparamba farm.

51. *Sericulture.*—In 1913–14 the fieldman on sericultural work in Kollegal was mostly occupied in missionary and advisory work. Although his teaching had had some effect, in 1914–15 an effort was made towards more practical work. He was ordered to work in a smaller group of villages, a rearing house was built for him in the taluk office compound and land on which mulberry could be grown was secured. The object was to see if he could rear disease free seed and whether the rearers would pay higher prices. Unfortunately early in the season the shed was burnt down, and the seed sent from Bengal was of very poor quality. The rearing house was then moved into one of the neighbouring villages and although the season was late 14,500 healthy worms were brought through the fourth moult. From these 13,000 good cocoons were sold for seed purposes at Rs. 2–12 a thousand when ordinary Mysore seed was fetching Rs. 2–4 or Rs. 1–8 per 1,000. The seed proved to be absolutely free from Pebrine and Flacheric the two most deadly of silkworm diseases. The work will be continued.

52. *Implements.*—When first attention was paid to agricultural improvements in 1864 a rush was made for the introduction of Western machinery. It often proved unsuitable and during the last eight years much more attention has been paid to local crops and improvements in local practices than to the sale of new ploughs, etc. However a demand for these is growing up, and implements are sold, lent or hired from the farms more extensively than is possibly known In 1914–15, 32 sets of drills and harrows were sold in Tinnevelly district, 27 Scind ploughs from Palur, 26 monsoon ploughs (mostly from Palur), 9 triangular harrows, 6 improved country ploughs; seven power sprayers and at least two improved jaggery furnaces. There were probably more of these latter made and sold as the West Coast has not reported figures. Besides these, ploughs were hired out or lent to four ryots near Anakapalli and to two at Nandyal, whilst at Coimbatore Rs. 150 was received from ryots for the use of heavier ploughs at Rs. 5 an acre. At Koilpatti arrangements have been made to hire to a village association with a view to eventual purchase a two furrow disc plough costing Rs. 220. One of this kind has done excellent work on the Koilpatti farm for two years and has attracted much attention. The country people have humourously dubbed it the "Chatty" plough. It has been very difficult to procure spares and even supplies at times in Madras and the Trade Conference was very useful in bringing this to the notice of all firms, etc. It is unfortunate that the increase in freights and cost of production due to the war has caused the retail price of most of these implements to be increased just when a real demand for them was beginning to appear.

53. *Live stock.*—The Government have decided to appoint an officer especially for cattle breeding but he has not yet arrived. Consequently, the work on cattle is confined to Coimbatore. The failures which have so repeatedly attended the efforts of Government to place breeding bulls at public institutions free for stud purposes have frequently been the cause of sorrowful comment in official reports. In these circumstances, the figures at Coimbatore where bulls have been kept at stud for the cattle of local ryots are interesting. This has been done since the farm was opened seven years ago, and the numbers of ryots' cows covered in each of these years are respectively, 5, 6, 52, 139, 247, 425 and 570 (last year); and this though the fee for service has been steadily raised from nothing to 12 annas a covering. This is a great contrast to past experience in other places. It is merely the result of keeping good bulls,

attending to the ryots promptly when they bring their cows and of gaining their confidence. The local demand exists. Agricultural officers chiefly in the Central Division assisted the ryots in getting their useless male stock castrated by the officers of the Veterinary Department.

54. *Cattle shows and Agricultural lectures, etc.*—Cattle shows were held at Ongole, Tiruppur and Madura. At the two last, agricultural lectures, demonstrations and exhibitions were given as well as at Pudukōttai and Ammapet. An exhibit was also sent to the Agri-Horticultural Society's show at Madras. The Tiruppur show is noticeable as being the only one managed by a District Agricultural Association (that of Coimbatore) without any aid whatever from local or provincial funds. This is most creditable. Another feature about it is the increasing interest in it displayed by the smaller breeder. Agricultural lectures have been given at many places in the districts. Two very successful demonstrations were held at Palur; but the most effective demonstrational work is done by meetings on the land of ryots who have successfully tried methods advocated by the department. This was done widely.

55. *Agricultural Associations.*—Of the old district associations Ganjām continues to do good work and also Coimbatore in the Tiruppur show. Madura also is keeping interest alive in its show. The village associations in Malabar, some 25 of them, have also done very good work. Some five co-operative agricultural societies have been formed for the joint purchase of manures, etc., but most of them have not as yet had a full year's work.

56. *Miscellaneous.*—The criminal tribes settlements at Kammapuram and Bommanigadda were visited by agricultural officers 10 and 9 times respectively and much advice and active assistance was given. In the latter station the utility of this was somewhat impaired by frequent changes of the officers in charge. The stations at Bethupadi and Bapatla were also visited. Reports on the possibilities of five other sites as agricultural settlements were prepared and submitted. General correspondence with literate ryots increases. In the head office at Madras 1,119 applications for advice were received direct from ryots.

57. *General Progress.*—The year has been one of widespread development on many lines. As compared with last year—the busiest then to date—the chief items in the balance stand as follows:—

(i) Twice the number of students were admitted to Coimbatore.

(ii) The method of dealing with palmyra disease was much improved and more than twice the number of trees were examined (220,403 against 100,741).

(iii) More than twice the number of areca palms were sprayed (29,000 against 14,000).

(iv) There was more than twice the area under pure seed of selected cotton (34,000 acres against 14,600).

(v) The area drilled by the ryots' themselves in Tinnevelly district increased by nearly 60 per cent. (11,329 against 7,117).

(vi) The area economically transplanted continued to increase and the sales of paddy for seed increased.

(vii) There was more than twice the area under Red Mauritius cane in South Canara (424 acres against 194).

(viii) The number of ryots' cows served at Coimbatore increased by one-third (570 against 425) although the fee was increased, from 8 As. to 12 As.

(ix) The number of monsoon ploughs sold increased from 3 or 4 to 26 independently of other implements, and of those which were hired out.

(x) District work was begun against smut and sufficient seed was treated to sow 1,100 acres. The average annual loss from smut is about 7 per cent. of the crop and is frequently much more.

(xi) Five more men were definitely allotted for district work in five more centres. Practical work on silk was also started.

But the call is still very general for more and more men in the districts. There are many fields of work untouched. It is a source of great satisfaction that the scheme for reorganization and ordered development has been so quickly sanctioned.

V.—AGRICULTURAL ENGINEERING.

58. In most other provinces all work on machinery required for agricultural purposes and within the purchasing power and capacity of the ryot to attend to it is dealt with by this department. In Madras it lies with the Director of Industries and to him and his department belongs the credit of spreading the use of oil-engines for well irrigation more widely, I beleive, than in any other part of India. That department has so far dealt with the erection of 413 power plants for irrigation A suggestion was made at the end of the year that this work together with agricultural engineering generally should be entrusted in future to this department. The matter is under examination. Messrs. Parry & Co. worked their steam tackle very successfully at Nellikuppam.

VI.—PUBLICATIONS AND SUPPLY OF INFORMATION.

59. Mr. Wood has almost completed a most useful note-book of agricultural facts and figures modelled on McConnell's book for Western farming, and M.R.Ry. Rai Bahadur K. Rangachariar is at work on an Elementary Botany. It is not realised at what cheap rates these books on agriculture are made available to the public. McConnell's book costs Rs. 6, Mr. Wood's for South Indian conditions, As. 14.

60. The following bulletins and leaflets have been issued during the year :—

Number.	Subject.	Prepared by	Language.	Number of copies printed.
		1914.		
III	Some general methods of controlling attacks by insect-pests—Agricultural methods.	T. Bainbrigge Fletcher ..	English ...	5,000
IV	Some general methods of controlling attacks by insect-pests—Mechanical methods.	Do. ...	English ...	5,000
V	The fodder question in Coimbatore	R. Cecil Wood	English ...	2,500
			Tamil	5,000
VI	* * * *	* * *	*	*
			*	*
VII	The Mahali or Koleroga disease of Arecanuts ...	W. McRae	English ...	300
			Canarese ...	400
			Malayalam ...	800
VIII	Possible use for oil engines when not required for pumping.	R. Cecil Wood	English ...	5,000
			Tamil	10,000
			Telugu ..	10,000
IX	Indigo	G. D. Mehta, Deputy Director of Agriculture, Central Division.	English ...	500
			Tamil	6,000
			Telugu ...	7,000
		1915.		
I	What the ryot has to say about the advantages of 'Daincha,' etc.	S. Subrahmanya Ayyar ...	English ...	15,000
			Tamil	15,000
			Telugu ...	15,000
II	What the ryot has to say about the advantages of 'Wild Indigo.'	Do. ...	English ...	15,000
			Tamil	15,000
			Telugu ...	15,000
III	What the ryot has to say about the advantages of 'Triangular Harrow.'	Do. ...	English ...	15,000
			Tamil	15,000
			Telugu ..	15,000

Very large numbers of leaflets were sent to Tahsildars and Revenue Inspectors for distribution. Over 73,967 copies of the Agricultural Calendar published in five languages were distributed through Tahsildars, Presidents of Taluk Boards and Assistant Inspectors of Schools.

VII.—STATISTICS.

61. *Crop forecasts and crop cutting experiments.*—Nineteen crop forecasts dealing with the sowings and outturns of paddy, cotton, sugarcane, gingelly, castor and indigo were issued. As a result of correspondence the Board of Revenue issued instructions altering the form in which Tahsildars should send in their returns and also arranged that Collectors should supply this office direct with more complete abstracts of cultivation from the village accounts. In accordance with the request of the International Federation of Master Cotton

Spinners and of the Trade Conference in Madras held in 1914, weekly statements of the quantities of cotton pressed at the various presses and used by the different mills in the Presidency are compiled and issued. Eighty-six crop cutting experiments were made on ryots' lands by officers of the department. These are of doubtful utility and the work always clashes with the time of harvest on the farms.

VIII.—MISCELLANEOUS.

62. *The Agricultural and Trade Conference*, 1914.—A most useful Conference was held in Madras in December between the chief firms interested in Indian produce, some leading agriculturists, representatives of railways, and officers of the Co-operative, Agricultural and Industrial departments which His Excellency the Governor very kindly opened. The Hon'ble Mr. Ll. E. Buckley attended every day. The Conference was the first of its kind and was especially useful in obtaining criticisms on lines of work and in clearing ideas for future methods of development in the districts. It was also a good advertisement of the nature and class of work in progress of which several firms were ignorant. It generally has promoted more knowledge and understanding and has made future work easier. The notes of the Conference have been published and are available for sale.

63. *Special Reports.*—The outbreak of war naturally produced many enquiries for outlets of produce and for new markets. Eighteen enquiries from firms abroad were received and information was given to them. These enquiries were also passed on to the producing districts. Two special reports were written for Government during the year—one on sugar, and one giving a history of the vicissitudes of the Agricultural Department since its inception in 1864 and especially assaying the work which has been done in the last eight years.

64. *Personal.*—It is a very great pleasure to record once more general good work at Coimbatore and in the districts. Under Mr. Wood the College continues to flourish and expand. The work which Mr. Harrison has done and published in India is deservedly obtaining recognition both in India and abroad. We have just heard that his University of Leeds has awarded him the degree of D.Sc. solely on the work which he has published from Coimbatore. The Southern Division has benefited greatly by an uninterrupted year of Mr. Sampson's administration. Among the Farm Managers M.R.Ry. Balakrishnamurti for work at Anakapalli and in Vizagapatam, M.R.Ry. Muttuswami Ayyar for some years' very careful conduct of experimental work at Samalkota, M.R.Ry. Govinda Kidavu for the work on the West Coast, and M.R.Ry. Kolandaswami Pillai for his management of Koilpatti and of the cotton work deserve special mention; whilst all were pleased to welcome to the department M.R.Ry. Rao Sahib A. Rama Rao who has done good work at Sivagiri. All congratulate him on his well earned title. Messrs. Couchman and Innes have again been of the greatest assistance.

65. Final accounts for the year have not yet been received from the Accountant-General, but according to the departmental accounts the total expenditure in the year was Rs. 4,95,980; receipts Rs. 98,540; net expenditure, Rs. 3,97,440.

The budget allotment was Rs. 5,32,300.

I have the honour to remain,

Sir,

Your most obedient servant,

D. T. CHADWICK,
Director of Agriculture.

APPENDIX I.

ADMINISTRATION REPORT OF THE AGRICULTURAL COLLEGE, RESEARCH INSTITUTE AND CENTRAL FARM, COIMBATORE, FOR THE YEAR 1914–15.

I. COLLEGE.

Teaching.—There was no change in the prescribed curriculum for the two senior classes, except that it was possible to give class III rather more instruction in Dairying than usual. They went on the usual tours, one in the northern districts, as far as Anakapalle, and one in the south through Tinnevelly to Ambāsamudram. Except during these tours, their work was supervised by the Assistant Principal.

Fresh lectures were written for the new classes. The skeleton syllabus was found on the whole very nearly correct, though slight adjustment will be necessary. More use was made of the Implement Museum: when dealing with this subject, one or two lectures were given in the museum itself. A chance question in one of the examinations showed the necessity for the strict maintenance of the students' observation books: owing to the absence of the Chief Assistant, and the extra work necessitated by the new course, it had not been possible to correct them, with the result that, failing the necessary spur, the students had not taken any trouble to prosecute private enquiries out of class hours. Notes by the lecturers in the various subjects are appended.

Chemistry.—Owing to the changes brought about by the new curriculum of studies, no lectures were given in General Chemistry. The old course in Physics given to the first year students has been abandoned, and in its place, sixteen lectures of a popular character were given according to the general scheme. In addition, eleven lectures of a similar type were given in Agricultural Chemistry.

Fifty-nine lectures on Agricultural Chemistry were given to the second-year class who also attended 28 practical classes.

Eighteen students presented themselves for examination at the diploma examination in Agricultural Chemistry and of these eight passed in the first class and ten in second class. There were no failures or third class passes.

Botany.—The new course of studies was introduced in June, and the first-year students received instruction as laid down in the syllabus. They had 28 classes during the year.

The second-year students of the old diploma course attended 57 lectures and 60 practical classes.

The Diploma Examination was held in December and, out of the eighteen students (inclusive of the student of last year) that sat for the examination, seventeen passed (two in first class, six in second and nine in third) and one failed.

Mycology.—The usual course on plant diseases, consisting of 27 lectures and 27 practical classes, was given to the second year students during the last term. In the final examination nine students were placed in the first class, seven in the second and one in the third.

The first year students of the new course had six demonstrations.

Entomology.—Eight lectures in Zoology and six preliminary lectures in Entomology were given to the first year students.

The second year students were given lectures on the chief crop-pests and the methods of control which should be used. The students were examined by Dr. Deslie Colemen, Director of Agriculture, Mysore. Four were placed in the first class, ten in the second and three in the third.

2. *Examinations.*—The outside Examiners for the diploma were Mr. Evans, Deputy Director of Agriculture in the Central Provinces, Mr. Aitchison, Principal, Veterinary College, and M.R.Ry. Narayanamurti of the Industries Department. All the students passed: the general standard was however low: it is probable that with the new course, a wider selection of students, and the chances of re-examination (which is not at present permitted), a higher standard will be more strictly adhered to. The second year students, examined in Agricultural Chemistry by Mr. Annett, in Agricultural Botany by Mr. Graham and in Mycology and Entomology by Dr. Coleman, have done very well: all will proceed to their last year. The College Medals were all won by Telugu students: the Clogstoun and the Keess going to Viraraghava Rao, who was very closely run by Viraswami for the latter: while Sitarama Patrudu obtained the Robertson prize.

3. *Students.*—The opening strength of the College shows an increase on previous years, due to the adoption of the new curriculum. In class III, there were fifteen, in class II, seventeen, while the new class contained forty-two. These were selected after a week's probation. There were no withdrawals from the senior classes: the first year class lost four, finishing with a strength of thirty-eight.

Hostel.—The hostel continued under the care of M.R.Ry. Tadulinga Mudaliyar as Warden. The increase in the work of keeping the hostel accounts, and supervising the catering arrangements, made it necessary to employ a wholetime officer, and eventually one M.R.Ry. K Hanumanta Rao, a retired Taluk Head Accountant, was selected as "Steward." This post carries with it a salary of Rs. 30, the cost of which is met by the hostel funds. The hostel during the year took over the non-vegetarian section, so that it now caters for every one, 32 Brahman, 20 non-Brahman vegetarian and 14 non-vegetarian: four students messed with relatives on the estate. It was found necessary during the year to raise the fees from Rs. 12 to 13 exclusive of the weekly oil bath: this was partly due to the general rise in the price of foodstuffs, and partly due to an improvement in the standard of the meals.

The auditing of the accounts was very kindly undertaken by Messrs. M. R. Ramaswami Sivan, T. V. Narayana Rao and B. V. Nath. There was an actual loss of Rs. 142 during the year which has been made up from previous savings.

The Students' Club.—The Students' Club finished up the year with a balance on the right side, and an account has been opened with the Bank of Madras. The new tennis court was used regularly and yet another will be needed for the coming year. The hockey team received colours for the first time and had a successful season: cricket and tennis matches were also played. A new ground was laid out in the maidan to serve as a football field. The Tennis championship was won by a first year student Rangaswami Pillai. The sports championship was won by V. T. Venkatajalam Mudaliyar.

4. *Building*—The library has been improved by the addition of two handsome screens which shut off the passage through one side of the room and thus ensure a greater privacy; in their construction were utilised some doors originally fitted to one of the library cases by mistake; doors of the correct pattern have now been fitted in the place of these. The big lecture room has been done up, and in it are to be found a full set of the college groups. Two Honour Boards, on which are carved the names of the Captain and Secretary of the Students' Club, are also fitted, so that this room will become the repository, so to speak, of college tradition. A handsome bench for the accommodation of visitors has been placed in the Front Hall.

Accommodation is found for the office of the Government Sugarcane Expert in addition to the regular College staff. The change in the curriculum has shorn the Physics Laboratory of much of its usefulness, and proposals will probably be submitted utilising the space in another way. Meanwhile, it was possible to find a separate room for the Assistant Principal.

5. *The Library.*—During the year about one hundred volumes have been added to the Library: 76 were purchased at a cost of Rs. 500 odd, the rest being obtained free, by presentation or exchange. Eight new periodicals were taken in, three of them being exchanges. Two hundred and eighty books were sent for binding during the year to the Government Branch Press at Ootacamund: two hundred more were sent to the Press at Madras. The catalogue of Bulletins, Leaflets, etc., has been sent to the Press and copies are expected shortly.

Certain proposals were discussed during the year for putting the library in charge of one of the sectional officers, and proposals have been submitted to the Director to this end, while changes in the method of circulating periodicals to the members of the college staff have recently been put into effect.

6. *Staff.*—The meetings of the college lecturers which had hitherto been informal were regularised under the name of the College Board. This meets to discuss general college and estate business, and also educational problems, when only those of the staff who are engaged in teaching, are entitled to vote. The minutes are kept by the Assistant Principal who acts as Secretary. The appointment of M.R.Ry. D. Ananda Rao Garu to this post, dates from the 17th July. The Chief Assistant was away from duty from the 2nd July to the beginning of the new year. Both the Veterinary Assistant and the Special (Agricultural) Assistant took a month's privilege leave. The post of Engineering Assistant was held by an acting man throughout.

The note book of Agricultural Facts and Figures was revised for publication during the year and is now in the Press.

7. *Visitors.*—The list of Honorary Visitors has been revised from the 1st January: the new list contains seventeen names as against twenty-five in the old list. Six Honorary Visitors on the old list visited the college during the year. The college was also visited by the Hon'ble Mr. A. G. Cardew and Mr. Coventry, C.I.E., the Agricultural Adviser to the Government of India. The Director of Agriculture paid three visits during the year. During the year, the Rev. Paul Beck of the Basel Mission resided on the Estate, for training in Farm Management and Estate Methods; on the outbreak of hostilities he had to leave.

II. Estate.

8. *Estate.*—There has been a great improvement in the water-supply, as additional pumping plant has been put down at well No. 60 in the south-west corner of the Estate. This supply is coupled up with the present pipe system, and serves the whole of the buildings south of the maidan, including all the hostel blocks, and the greater portion of the B and C type quarters, thus saving the college well, which has been able in these conditions to meet all demands. Progress has also been made in planning for future extension on the Estate and on the south-east corner arrangements have been made for the orderly expansion of the Colony: here will be placed the new Provincial officer's quarters, and the removal of the scavengers' quarters, the tidying up of the corner and the provision of a proper gate will materially improve what is at present rather a back entrance, although a popular entrance, to the Estate.

9. *Quarters.*—It is feared that delay will be experienced in the construction of the new quarters needed. Two Provincial officers' quarters, for the Government Lecturing Botanist and the Assistant Principal, nine B type and ten C type have been sanctioned. A certain amount of relief was experienced by the taking over from the department of Public Works of the old contractor's quarters, whereby one C, three Intermediate and eight D type were added to the Estate. Recently sanction has been obtained to the acquisition of the stretch of land between this and the Forest College; the buildings including the Rest house for Indian visitors, dispensary, etc., have not yet been begun.

10. *Sanitation.*—Poudrette was manufactured on the Estate as usual: some two hundred cartloads were produced during the year, which were utilised to manure guinea grass, fodder cholam and paddy. The utilisation of the sullage water from the houses is also under contemplation, by the provision of a drain to run south of the quarters towards the west, where land can be found on which this water can be used. This will improve what is at present an unsightly and odorous drain, and save the waste of water which now occurs. During the year nineteen births and seven deaths were recorded. No serious epidemic appeared. The Sanitary Staff inaugurated an energetic mosquito campaign on the advice of the Entomologist, and this has been most successful. Mosquitos have not been exterminated, though constant search is made to find out where they are breeding, but the numbers have been enormously reduced to the comfort of everyone on the place.

Quarters are to be provided of the standard design for the Estate scavengers, in the south west of the Estate and work has recently begun.

III. Farm.

11. *Farm.*—The season presented surprises all through. Drought marked the opening months, and this following on the short rainfall and small straw crops of the previous year brought about a serious shortage of fodder. It was not until September that proper sowing rains were received, but from then onward the rains were plentiful and well distributed. A fall of 2·4 inches occurred in January, and interfered considerably with the paddy harvest, while on the 28th February, the unprecedented fall of 3·3 inches was received. This has improved the grazing wonderfully, and as last year's crops were above the average, the fodder in reserve at present is more than usual.

Apart from a trial of a motor tractor which took two 2-disc ploughs through the black cotton soil in F. 37, considerable progress was made in improving the methods of tilling of the land. A great fillip was given to hot weather ploughing by the late rains, and quite a business has been done in hiring out ploughs to neighbours. There is considerable scope for work of this kind in the vicinity, could men be spared for it.

12. *Livestock.*—A slight increase in numbers is recorded. More bullocks have been purchased to meet the increasing demands of the students' classes; and the dairy herd is still in need of more cows

Attention may be called to the popularity of the Farm stud bulls: in spite of a rise in price from 8 As. to 12 As., 570 animals were brought for service, both cows and buffaloes. The figures for the past seven years are interesting: 5, 6, 52, 139, 247, 425, 570. This shows clearly that owners are fully alive to the value of goodstock, and that if treated fairly and promptly by some one in whom they have confidence as they have in the Veterinary Assistant, Mr. D'Silva, they will readily make use of Government bulls. The number of cases treated at the hospital also showed an increase.

Miscellaneous additions to the livestock, included a jutka pony, and some leghorn fowls. The second annual sale was held in February, when fair prices were realised.

13. *The Dairy.*—This Institution was under the immediate control of the Assistant Principal and has shown a gratifying improvement. The greatest business is done in the sale of fresh milk and at present no attempt is made to work out the cost of production, the milk being simply credited to the Farm at a uniform rate of one anna a pound. There is little doubt that it costs less than this to produce, as we can buy plenty of milk in the neighbourhood at this price. The sale of butter has rapidly risen. One thousand and seventy-five pounds were sold in the previous year: the figure for this year is 1,886 lbs. A profit and loss account is given below.

To | By

	Rs.	A	P.		Rs.	A.	P.
Purchase of milk—							
Farm 53,357 lbs.				Sale of milk	3,090	3	9
Outside 25,952 lbs.	4,956	13	6	Cream	91	4	3
Depreciation—				Butter	1.909	2	0
Buildings at 2 per cent. on 9,000	291	9	7	Ghee	132	10	10
Plant 12 per cent. on 930 ...				Separated milk	498	8	4
Establishment	395	9	0	Butter milk	52	1	4
Petty expenditure	63	14	2	Curds	2	12	10
Balance being profit	69	7	1	Stock in hand	0	10	0
Total ...	5,777	5	4	Total ...	5,777	5	4

14. *Staff.*—The Farm Manager at the commencement of the year was M.R.Ry. Rajagopala Achari: he was relieved by M.R.Ry. Thiru Muruganathan Pillai in June. In November his place was taken by M.R Ry. S. Subrahmanya Ayyar. The Assistant Farm Managers during the year were Unnikrishna Menon, S. Narayanayya and K. T. Bhandary. A Veterinary Assistant Farm Manager was posted to the farm in August, and has been placed in charge of the feeding of all farm cattle and calves: he is also in charge of the Leghorn poultry which were obtained towards the end of the year.

15. *Accounts.*—

Profit and loss account for the year ending 31st March 1915.

Dr. Cr.

	Rs.	Rs.		Rs.	Rs.
To amount as per valuation, March 31, 1914—			By receipts	...	19,504
Livestock (*a*)	15,366		By amount as per valuation, March 31, 1914—		
Tillage and standing crops ...	1,421		Livestock (*a*)	18,101	
Produce in store	4,863		Tillage and standing crops ...	2,187	
Implements	9,090		Produce in store	10,255	
Machinery (*b*)...	16,960		Implements	9,802	
Buildings and estate improvements (*c*)	58,505		Machinery (*b*)	21,301	
		1,06,205	Buildings and estate improvements (*c*)	60,953	
					1,22,599
To charges in the year		43,491	By balance being loss		7,593
		1,49,696			1,49,696

(*a*) Includes dairy herd and stud bulls. (*b*) Includes dairy machinery.
(*c*) Includes dairy building.

Coimbatore,
4th May 1915.

R. CECIL WOOD,
Principal.

APPENDIX II.

ADMINISTRATION REPORTS OF THE AGRICULTURAL STATIONS DURING THE YEAR 1914–15.

Administration Report of the Deputy Director of Agriculture, Northern Division, for the year 1914-15.

I have the honour to submit the administration report of my division for the year 1914–15.

1. *Staff*—I was in charge of the division until the 9th May 1914 and from the 9th November 1914 until the end of the year. During the interval I was on leave and Mr. Roger Thomas, Probationary Deputy Director of Agriculture, acted in my stead. As usual most of the

year was spent in camp, all the farms received frequent visits and tours were made in the district.

The recently formed sub-division remained under the charge of M.R. Ry. D. Ananda Rao Garu, Assistant Director of Agriculture, until 1st July 1914 when M.R.Ry. K. Ramasastrulu Nayudu Garu took over charge from that officer.

2. *District work.*—(*a*) *A Local cotton.*—*Bellary district.*—Work was carried on along the usual lines and the same type of cotton Hagari No. 1 continued to be distributed. The year marks a great advance in the expansion of this work. The sowing rains were timely and there was a large demand for our seed but at a lower rate than that asked, namely, 26 lbs. per rupee, which was considered excessive. The price was reduced to 30 lbs. per rupee, *i.e.*, 14 per cent. higher than the rate for local cotton, and 51,943 lbs. were sold. This is sufficient to sow 7,200 acres.

Six hundred and seventy-four acres of seed farm were sown to produce seed for distribution next year.

(*b*) *Cambodia cotton.*—As was the case last year kappas was bought locally, ginned by the department and the seed distributed. One thousand seven hundred and thirty-two pounds were sold in the Bellary circle and 680 lbs. in the Circars. In the latter area, more particularly in Vizagapatam, the crop did very well and gave very good yields. The quality of the produce is also better than is the case in the Ceded Districts. Expansion of the area under this crop is however likely to be checked by the fall in the price of cotton.

(*c*) *Sugar-cane.*—Attempts to effect an improvement in the method of cultivation in Gōdāvari district have been given up. The area under this crop in this district is not big enough to warrant further work considering the expansion of work in other directions and the shortness of staff and the yield with the present indifferent cultivation is too good for the ryot to bother about possible means of correcting the defects in his method of cultivation. There is a much better field for work with this crop in Vizagapatam district. The area of the crop is bigger and the cultivator is more alive and readier to consider suggested methods of improvement. Work here will consist in (*a*) distributing canes of a new variety, B. 1529, to replace B. 208 which has already got a hold in the district but is proving unsuitable as the buds begin to shoot when the canes begin to ripen and the quality and quantity of jaggery are affected; (*b*) inducing cultivators to plant the crop in rows, (*c*) advocating the use of oil-cake as manure for this crop and (*d*) endeavouring to persuade cane-growers to improve their furnaces. A start with this work has already been made and 45,700 setts of B. 1529 have been distributed, 16,400 lbs. of castor-cake distributed for the 1914–15 crop, two improved furnaces erected and arrangements have been made to supply oil-cake to ryots who wish to try this manure for their next season's crop.

(*d*) *Paddy.*—(1) *Improvement in cultivation.*—In Gōdāvari district where most of this work is being done the work was expanded. One hundred and three acres were sown at the departmental rate and 2,800 acres were transplanted with single seedlings. This however does not by any means represent all the work that has been done in pushing this improvement in this district. While arranging for the sowing and transplanting of these demonstration plots the district officers endeavour to get other ryots to reduce the seed-rate they employ without bothering them about single planting, as it has been found that if they can be induced to do the first, their coolies will automatically do the second for them. Thus many ryots who hesitate to adopt the departmental method in its entirety try a small reduction in the seed-rate one year and make a further reduction the next until they arrive at a rate not very much higher than that advocated by the department. In this way a gradual reduction in the seed-rate is being brought about and in most of the villages in which we have worked the mamool rate is now considerably lower than it used to be—

(2) *Seed distribution.*—Most of this was done from Samalkota farm, where 21,200 lbs. of seed were distributed. At Anakapalle 920 lbs. of seed was distributed and seedlings from thin sown seed beds sufficient to transplant in all 4 acres were distributed to 48 ryots to demonstrate to them the advantage of planting good healthy seedlings.

(*e*) *Green manure.*—Three thousand eight hundred pounds of green-manure seeds chiefly sesbania were distributed. Most of this work was done in Gōdāvari district.

(*f*) *Treatment of sorghum seed against smut.*—The treatment of sorghum seed with a 2 per cent. solution of copper sulphate has been advocated generally wherever sorghum is grown in those tracts where we have district officers working. In this division the Ceded Districts offer the biggest field for this work and an organised attempt was made there this year to bring about the adoption of this practice. In the Bellary circle 1,100 acres of sorghum were sown with seed treated under the supervision of the district officer in which area no smutted heads were noticed when the fields were inspected.

3. *Implements.*—The gallows plough is now doing duty at Anakapalle and is turning out satisfactory work there, as is the smaller E.T. plough which is being found extremely useful for garden cultivation both there and at Hagari. As regards the disc plough further trials have been made both at Hagari and at Nandyal, and the general conclusion arrived at, that for use on the dry land in these districts work will have to begin in December while there is still some moisture in the land as later it becomes too hard and the plough does not work deeply enough nor does it lean furrow.

Hagari Agricultural Station.

Season.—The rainfall was in defect and was almost wholly confined to the south-west monsoon period. As is usual in such years the early sown crops were good, but there was not enough moisture to ensure a satisfactory yield of cotton and only enough to carry the sorghum crop up to the flowering point but no further.

2. (*a*) *Cotton.*—The crop was sown in good time but as indicated above gave only a poor return. The average acre-yield amounted to 148 lbs. for the pure and 96 lbs. for the mixed crop. The best yield was 256 lbs. from a plot of Hagari No. 25 sown for seed purposes.

(*b*) *Sorghum.*—The yields of grain from this crop were miserable and of straw fair. The average acre-yield of grain was 15 lbs. and of straw 1,156 lbs. A better yield of grain was obtained by sowing the crop thinly in the Bengal gram crop though in this case the yield of straw was greatly in defect. The figures were 36 lbs. grain and 320 lbs. straw per acre.

This year a fair area was put down under fodder sorghum which considering the season has done remarkably well and has given an average yield of 3,000 lbs. per acre. The practice might well be taken up by the local cultivator and would, if adopted, relieve him in a few years of anxiety with regard to his fodder supply.

(*c*) *Bengal gram.*—The crop this year was in every case grown mixed with a small quantity of sorghum to ensure a supply of seed of that crop. The average acre-yield was 80 lbs. and the highest 100 lbs. both of which are distinctly poor.

(*d*) *Safflower.*—This crop was grown on a small area and gave an average acre-yield of 220 lbs.

3. *Garden crops.*—The crops in the garden this year have in the main done well and the yields of ragi, groundnut and tobacco are about the best we have ever had. This is largely attributed to the manuring the fields received from the folding of sheep upon them.

(*a*) *Ragi.*—The average acre-yield of this crop this year was 2,325 lbs. grain and 5,037 lbs. of straw, an advance on last year's figures. The best yield was obtained from an area of 62 cents and amounted to 3,334 lbs. grain and 7,750 lbs. straw.

(*b*) *Sugar-cane.*—The season has again been against this crop and the yield is low, only 3,500 lbs. of jaggery per acre.

(*c*) *Onions.*—The crop was normal and gave an average acre-yield of 9,846 lbs. of bulbs dried and ready for market.

(*d*) *Cambodia cotton.*—This crop this year was very free from disease but has not given a very heavy yield though it was good for the year. It was grown on a total area of 1·33 acres and gave an average acre-yield of 486 lbs.

(*e*) *Tobacco.*—A very good yield of 1,350 lbs. of cured tobacco was obtained. The crop has proved one of the most profitable of the garden crops this year.

(*f*) *Groundnut.*—This crop was grown both pure and mixed with grain crops. The former did exceedingly well and gave a yield of 1,830 lbs. of dried nuts per acre. The latter suffered from the luxuriant growth of the grain crops and gave only 313 lbs. of dried nuts per acre.

(*g*) *Chillies.*—The total area under this crop was three-quarters of an acre and an average yield of 2,473 lbs of green and 345 lbs. of ripe chillies per acre was obtained.

4. *Sheep.*—The flock has again done well and 28 lambs were dropped during the year, three of which died. A few of the ewes were bred from twice in the year and one ewe produced twins. This performance seems to be somewhat of a novelty in this neighbourhood and not a few visitors came to see the lambs.

During the year some store lambs were bought in to be folded on the green-manure crops grown in the garden and fattened. They were fed with crushed cotton seed as concentrated food, but did not make the growth they ought to have done. On this account and because of the heavy cost of producing the green-manure crops the experiment was not a financial success. It has, however, shown that if lambs which had not been robbed of part of their mother's milk could be got there would be a reasonable chance of making a profit, and that this plan of feeding off green crops is an excellent means of manuring the land. The experiment is being repeated with some farm-bred hoggs this year, but these are only now coming on for sale. Two of the best were disposed of in Bellary market and realised Rs. 13 - 12 each. Their live weights were 116 and 120 lbs. respectively. A three-year old ram weighing 125 lbs. was sold at the same time and brought Rs. 17-8-0. Weighments of these fattening hoggs are being taken once a month and the results so obtained show that they are making an average increase of 4 oz. per head per day.

The flock as it stood at the end of the official year consisted of 58 individuals; 2 rams, 22 breeding ewes, and 34 lambs.

5. *Staff.*—Farm Manager K. Narayana Ayyangar was in charge of the farm (black-cotton soil area) throughout the year. Farm Manager S. Ramaswami Pillai was in charge of cotton work and district work generally. Assistant Farm Manager G. R. Venkatachellapati was in charge of the garden. Assistant Farm Manager V. S. Subrahmanya Sastri did duty in the farm up to 1st November 1914 when he went on combined privilege leave for one month and twenty days and furlough for one year. Assistant Farm Manager Bhairy Siva Rao joined duty at the farm from Anakapalle on the 6th January 1915.

Samalkota Agricultural Station.

Season.—The rainfall during the south-west monsoon period was slightly below the average and the north-east monsoon rains failed altogether. The season was however otherwise favourable.

2. *Crops*—(*a*) *Sugar-cane.*—This year this crop was again very satisfactory. Germination was good and there was very little red rot present, only ·5 (point 5) of the clumps on an area of 2·94 acres containing canes which were diseased. The average acre-yield of raw-sugar works out at 10,000 lbs. which is one candy less than last year and five candies above the average for the district. The best yield was obtained from B. 3412 which on an experimental plot of 6·7 cents yielded at the rate of 18,574 lbs. of raw-sugar per acre.

(*b*) *Paddy*—(1) *Rainfed.*—The season was favourable to this crop inasmuch as the distribution of the rain was such that it was unnecessary to give any irrigation. The yields however are in no way startling, though the average acre-yield of 1,700 lbs. grain and 3,800 lbs. straw over an area of 2·17 acres is good. The two budama varieties, black and white, are the best yielders and the former gave the highest yield of the year 2,980 lbs. grain and 6,560 lbs. straw per acre from an experimental area of 6¼ cents.

(2) *Irrigated.*—Satisfactory yields have again been obtained from this crop. The crop was only very slightly affected by smut and lodging was limited to a small area. The average acre-yield for the whole area under this crop for the main crop season was 3,059 lbs. grain and 3,568 lbs. straw.

(*c*) *Green-manure crops.*—The experiment tried last year of mixing other green-manure crops with sunnhemp, to occupy the land after the removal of that crop for fodder ended in failure. It has been tried again this year, but does not promise any better success. For this purpose sesbania is no good as it does not succeed when sown in the standing crop of paddy even when alone. As regards the other crops indigo and cassia tora, sunnhemp seems too heavy a shade crop.

(*d*) *Cambodia cotton.*—As a pure crop the yields this year from this crop are a record 1,796 lbs. of kappas per acre from an area of 24 cents. As a mixed crop the yield was miserable, 93 lbs. of kappas per acre from 20 cents.

(3) *Experimental work.*—As a result of the experimental work that has been done at this station the following conclusions have been arrived at with regard to sugar-cane and paddy.

3. *Sugar-cane*—(*a*) *Manuring.*—The question of which oil-cake will be the most paying to use for this crop will, provided that the quantity of nitrogen applied in this farm is from 100 to 125 lbs. per acre, be settled by the availability, price and nitrogen content of the cake. For with this proviso one cake is as good as another.

(*b*) *Varieties.*—Of the two Java varieties, both of which are able to withstand drought and water-logging 36 is a poorer yielder than 247.

Another conclusion that may safely be recorded, though it is hardly an experimental result is that red rot disease can be checked and kept within bounds by a rigorous selection of setts.

4. *Irrigated paddy*—(*a*) *Cultivation experiments.*—(1) In this delta the practice of breaking up the land a long time before the planting of this crop is not to be recommended as it results in a lower yield being obtained.

(2) A seed-rate of 210 lbs for an acre of seed bed is ample and will provide sufficient seedlings to transplant 20 acres of crop with single seedlings.

(3) Provided the crop is planted in good time it is matterless whether the seedlings are 25 or 45 days old at the time of transplanting.

(*b*) *Manuring.*—(1) An application of five bags (820 lbs.) of castor-cake *plus* 2 cwts. of superphosphate, gives an increased yield as compared with a similar application of cake with or without potash or no manuring at all. A similar result has to be recorded if green-manure is substituted for castor-cake.

The profitableness however of these methods of manuring more particularly the first mentioned will depend on the residual effect of the manures which is being tested.

(2) The application of 5 tons of straw per acre with a complete manuring compared with a complete manuring alone reduces the yield in the second crop season, both of grain and straw and in the main crop season does not materially affect the yield of grain but greatly increases the outturn of straw.

5. *Seed distribution.*—The following qualities of seed have been distributed during the year:—

	LBS.
Paddy—	
Konamani	12,365
Rasangi	4,938
Garikasannavari	1,360
Other varieties.	2,542

Green-manure seeds—	LBS.	
Sesbania	2,022	
Sugar-cane	1,122	canes mostly outside the Presidency.
Cambodia cotton	280	

6. *Staff.*—Farm Managers V. Muthuswami Ayyar and N. Sitaramaswami Nayudu were stationed at this farm throughout the year. The former in charge of the farm and the latter in charge of the district work. Assistant Farm Manager S. Subbayya remained at this station until the 2nd August 1914 when he was transferred to the Central division. He was on privilege leave for 2 months from 1st April 1914. Assistant Farm Manager D. Panakala Rao remained at this farm throughout the year except during the period from 7th June 1914 to 11th August 1914 when he was on leave on loss of pay. Assistant Farm Manager K. Ramanuja Achari joined duty from Managanallur on 8th June 1914. He was on privilege leave for 3 weeks from 26th January 1915 to 15th February 1915.

Anakapalle Agricultural Station.

During the year under report the necessary preliminary arrangements for bringing this station into working order were completed. The buildings in the station are now quarters for three officers, a seed-store, a cattle shed with manure pits and an implement shed, with a small room for preparing cattle-food attached. Wells have been filled up and the dry land fields levelled. All that now remains to be done is the erection of a pumping plant near one of the wells which work it was expected would have been finished last hot weather. It has now been taken in hand and it is expected to be completed before the break of the next monsoon. The land has been laid out and its final division into dry land, garden land and wet land made. By mutual arrangement with neighbours some awkward bends and corners in the boundary line have been got rid of and the fence line is now as straight as it is possible for it to be. The area of the farm now consists of 9·7 acres dry land, 11·0 acres garden land, 16·0 acres wet land and 4·35 acres taken up by farm-yard buildings, roads and bunds.

Up to present no experimental work has been done except in so far as the testing the suitability of new varieties of sugar-cane and new crops like Cambodia cotton to the climate and land, can be called experimental work. The cropping scheme was arranged with the object of finding the most uniform areas on which to carry out experiments, but owing to heavy rains in September the embankment of the river breached and the farm was flooded. The surface soil was washed from dry land fields into the garden land and both had to be relevelled. Both garden and wet land crops were submerged and sugar-cane lodged. We are therefore no further on than we were and this work will have to be done again.

2. *Season.*—The rainfall recorded for the year amounted to 45·7 inches, 9 inches heavier than last year. Its distribution was however very faulty. Practically all the rain was received in the south-west monsoon period and most of it fell in heavy showers which did more harm than good. The rain received in the north-east monsoon period amounted to ·12 inches only, there were therefore no cold weather crops grown on the dry land.

3. *Crops*—(*a*) *Dry land.*—Sazza was the only crop grown during the year, and from the seed-bed to the threshing floor it was dogged by unfavourable conditions.

Timely rains for the sowing of seed-beds were received in May but when the seedlings were ready for planting rain held off and they were rather old before this operation could be carried out. Immediately after planting a spell of wet weather set in which retarded the growth of the crop. This was followed by a spell of very dry weather which in moderation would have been useful but was carried on for too long a period. The weather after this was propitious but at the time of harvest when dry weather would have been exceedingly welcome heavy rain set in again and interfered with harvesting operation.

The return from this crop 1,537 lbs. grain per acre was therefore only fair.

The average acre-yield of sazza straw is not available as it was damaged by floods in consequence of which no weighment was made.

The seed-beds of ragi, the crop which should have followed sazza were spoiled by the flood and horsegram which was sown in its place was a failure owing to the lack of rain in the north-east monsoon period.

(*b*) *Garden land—Cambodia cotton.*—The crop sown in August-September of 1913 was allowed to produce a second picking in April-May of 1914 and gave the handsome yield of 1,400 lbs. per acre from an area of 2½ acres. The first sowing of this year's crop was spoilt by the flood and the second sowing which was a little late has done fairly well. Only one picking has been taken as the field is required for a early crop. But this has given 720 lbs. of kappas per acre which is good considering all conditions. These yields and the quality of the product show that the introduction of this crop in this district will be successful. There is likely to be some initial difficulty in getting the produce ginned and in finding a fair market for the crop but endeavours will be made this year to get round these difficulties.

Other crops grown on the garden lands were fodder sorghum, ragi and korra in the punaa (early) season and ragi in the pairu (cold weather) season.

The first named crop did very well and gave the excellent yield of 25,100 lbs. of green fodder per acre. Early ragi and korra gave fair yields 1,544 lbs. and 1,371 lbs. of grain per acre respectively and pairu ragi was good yielding 2,542 lbs. of grain per acre.

(c) *Wet lands.*—In the punasa season gogu and ragi were grown. The former gave a fair yield of 729 lbs. of fibre of fair quality per acre. The latter was poor and gave an average acre-yield of 1,043 lbs. of grain per acre.

In the main crop season paddy was grown over the whole of this area except that part occupied by sugarcane.

In the beginning the season was favourable to paddy but the damage done by the flood followed by the failure of the north-east monsoon rains has caused the yields of this crop to be considerably lower than they ought to have been.

The following varieties were grown and gave the average acre-yields noted alongside:—

	Grain.	Straw.
Bobbiliganti	871	888
Mypali	2,092	2,483
Azzanum	1,917	2,370
Maharajabogam	2,246	3,209
Balaramabogam	2,209	3,505
Gunupurapu sannalu	2,239	3,029

The low yield of Bobbiliganti is partly due to the bad season but mainly to the fact that it followed the crop of gogu previously mentioned. It is the practice in this district to take three crops from the wet lands, one in the early or punasa season, one in the main season and one in the late or pairu season. The early and late crops are of short term, *e.g.*, ragi, gogu, gingelly, onions, maize, etc., and most of them can be grown in both seasons. The main crop is always paddy. It is a question whether it would not pay better to grow a green-manure crop in the punasa season to be ploughed in and to transplant the paddy crop earlier. The low yields obtained from Bobbiliganti as compared with yields from the three last mentioned varieties favour the proposed change. The question however will be one of the first to be tackled as soon as experimental work can be begun. The yields of azzanum and maharajabogam are lowered by their having followed paddy seedlings on part of the area which they occupied. The average acre-yield for the whole paddy crop this year was 1,897 lbs. grain and 2,557 lbs. straw, and the best yield was 2,565 lbs. of grain and 3,750 lbs. straw given by maharajabogam in field No. 24.

(d) *Sugar-cane.*—The following varieties B. 6,450, B. 208, B. 1,529 keli and bonta were grown. In common with the other crops of the farm this crop had a series of trials to contend against.

These began early on with the flooding of the fields by a heavy rain shortly after planting. This was followed by a very dry hot period. Later after a period of comparative quiet the crop was laid flat by a cyclone and subjected to a prolonged submersion by the flood. Bonta however was the only variety which seemed to have lost heart and added red rot to its list of troubles. The others did fairly well and B. 1529 particularly seems eminently suitable for this tract. B. 208 on the other hand is proving unsuitable. With the cessation of growth when the cane begins to ripen the buds in this variety begin to develop and form shoots. This is a disadvantage in two ways, the quantity and quality of the jaggery is affected even if all the shoots are cut off before crushing the cane, and when the cane has to stand a short time before planting is done it is impossible to cut it into setts without damaging the young shoots, which of course acts detrimentally on the stand of the succeeding crop. For these reasons the further spread of B. 208 will not be encouraged and B. 1529 will be distributed in its place.

The average acre yields were as follows:—

B. 6450, B. 208, B. 1529, Keli, Bonta.

4. *Seed-distribution.*—This has been confined mainly to green-manure seeds, sugar-cane, paddy and Cambodia cotton. The quantities are as follows:—

	LBS.
Paddy	920
Green-manure seeds	1,600
Cambodia cotton	400
Sugar-cane setts	45,700

Paddy seedlings from thin sown seed-beds sufficient to transplant acres were also distributed to 48 cultivators in the neighbourhood of the farm. During the year an attempt was made to revive the indigo industry in tracts where it had formerly flourished, and a large quantity of indigo seed was purchased for distribution. The extracting plant in the district is however in such bad repair that no owner could be induced to put his in order on the chance of making a profit though the cultivators were willing enough to grow the crop and supply material. The seed is however being distributed and up to the end of the official year 5,576 lbs. had been disposed of.

5. *Implements.*—Light iron ploughs were lent to six ryots two of whom purchased ploughs for themselves, one a Punjab plough and one an E.T. plough. The use of these light iron ploughs was demonstrated in the district and on the farm to visitors and it is expected that a demand for these will arise as soon when cultivators have become better acquainted with their usefulness.

6. *Staff.*—Farm Managers M.R.Ry. D. Balakrishnamurthi and M.R.Ry. L. S. Natesa Ayyar worked on this farm throughout the year. Assistant Farm Manager Bhairy Siva Rao remained until the 4th January 1915 when he left for Hagari. Assistant Farm Manager T. Budhividheya Rao joined duty on 15th May 1914 and remained at this station throughout the year.

G. R. HILSON,

14th May 1915. *Deputy Director of Agriculture, Northern Division.*

ADMINISTRATION REPORT OF THE ASSISTANT DIRECTOR OF AGRICULTURE, NORTHERN DIVISION, FOR THE YEAR 1914-15.

I have the honour to submit the Administration Report of the sub-division for the year 1914-15.

Staff.—During the year under report M.R.Ry. D. Ananda Rao Garu, now Assistant Principal, Agricultural College, Coimbatore, was in charge of the sub-division till the 1st of July. I relieved him on the 2nd and remained in charge of the division till the end of the year. During his three months' period, my predecessor spent 45 days in camp. He visited Nandyal and Sirvel Agricultural stations thrice, inspected the Patimannu substitute experimental plots once, and attended the selection of students for entrance into the Coimbatore Agricultural College in June. A portion of his time was also occupied in making enquiries into the raising of early seed-beds for paddy in some of the villages in the Kistna Western Delta. During my period of nine months in the sub-division, I spent 116 days in camp. I visited Nandyal and Sirvel Agricultural stations eight and seven times respectively, and inspected the pattimannu substitute plots twice. In addition I visited Tatapudi Lanka and Ponnalur tank and submitted reports thereon.

At the Nandyal Agricultural Station, Farm Managar M.R.Ry. M. Raghavulu Nayudu was in charge from the beginning till the 5th of May in addition to his district work on cotton improvement. From the 6th of May he was on privilege leave for six weeks while the farm was managed by the Assistant Farm Manager V. S. Ramaswami Ayyar till 13th June on which latter date Farm Manager M.R.Ry. T. V. Rajagopala Achari joined duty and managed the farm till the end of the year. Assistant Farm Manager V. S. Ramaswami Ayyar was transferred to Sirvel where he joined duty on 27th June 1914. Assistant Farm Manager V. Ratnaji Rao was the only Assistant who stayed in the Farm throughout the year helping the managers. In the district work round about Nandyal, there were no changes in the staff. M.R.Ry. M. Raghavulu Nayudu conducted the cotton improvement work single-handed throughout the year.

At Sirvel, Farm Manager M.R.Ry. V. G. Dhanakoti Razu was in charge of the farm almost single handed from the beginning to the end, save for a short period of three months and fifteen days, from 27th June to 10th October, when he was helped by the Assistant Farm Manager V. S. Ramaswami Ayyar. The latter was on privilege leave for one month and fifteen days from 9th October to 24th November, after the expiry of which, in about a week, he was deputed to Nandyal to help the staff in the selfing of cotton selections, where he remained on duty till the end of the year. There were changes in the farm clerks of this station and on more than one occasion the Farm Manager had to get along without either an Assistant or a clerk.

DISTRICT WORK.

(a) *Cotton Improvement.*—As in previous years, cotton improvement work consisted of the establishment of seed-farms and the distribution of good seed amongst ryots. Seed for the seed-farms was given free and land assessment was paid. Good kappas from the seed-farms of 1913-14 were purchased at the highest market rates, ginned on the farm and good seed was distributed both to the seed-farms of 1914-15 and to the ryots in general. Of the 43,899 lbs. of good seed of plant No. 2 obtained from the seed-farm kappas of 1913-14, 37,774 lbs. were sold. Of this 9,430 lbs. was given to the seed-farms, 21,868 lbs. amongst ryots in the Nandyal taluk and nearly 6,476 lbs. in Koilkuntla, Sirvel, Atmakur and Nandikotkur taluks. In addition 7,415 lbs. of seed from the ordinary sircar cotton belonging to the Polur seed-farms of 1913-14 was sent to Proddatur, Jammalamadugu and Dhone taluks, where, for want of proper agencies only 2,392 lbs. were sold for sowing purposes and the rest disposed of as cattle-food. The total quantity then of cotton seed distributed for sowing this year is 40,166 lbs. (37,774 and 2,392) which should be sufficient to sow nearly 4,463 acres taking 9 lbs. as seed-rate. This area includes seed-farms. During the year under report, seed-farms were concentrated at Gundupapala, Gospad and Pasarapad. The area under these amounted to 1,050 acres where plant No. 2 was sown. The cotton crop in the seed-farm areas

as well as outside suffered more from the drought in the north-east monsoon period than the cottons on the farm, for want of repeated interculturings and deep ploughing.

(*b*) *Cambodia Cotton.*—Work with this crop consisted chiefly in distributing good seed amongst the ryots. For this 7,539 lbs. of good kappas were purchased, ginned and good seed was kept for distribution. Out of 4,031 lbs. of good seed obtained 3,089 lbs. were sold. Demand for this seed seems to be gradually decreasing, the chief reason being that Cambodia cotton cultivation has extended far and wide in the district and that the ryot can get his seed supply almost anywhere.

(*c*) *Green Manures General.*—For want of sufficient hands, the work in this direction could not be pushed ahead.

Dhaincha seed farm areas.—Last year when attempts to grow Dhaincha for seed as a mixed crop on land taken in lease for the purpose failed, some hope of solving this problem was discovered when the department was able to buy nearly 2,032 lbs. of seed from ryots amongst whom 41 lbs. of this seed had been distributed for sowing with the promise that the department would buy all the seed they produced for sale. Accordingly this year both at Nandyal and Sirvel nearly 108 lbs. of Bengal dhaincha was distributed to 22 ryots, who brought 1,865 lb. of seed for sale. This seed was bought at the rate of 5 Madras measures a rupee equal to roughly 17½ lbs. At the beginning of the year Nandyal farm had a stock of 2,065 lbs. Thus the total quantity of seed kept in stock during the year amounted to 3,930 lbs. of which 2,507 lbs. has been sold up to date.

Wild indigo.—During the year in November enquiries were made regarding the supply of wild indigo from Devarapalli and its vicinity in the Kistna district. Wild indigo grows in these parts and since the people are not accustomed to its collection and are more in the habit of collecting Cassia tora for which they get 3 to 4 rupees a bag of 50 Madras measures, it was not possible to obtain large supplies of wild indigo. The Karnam of Devarapalli was, however, kind enough to procure for the department 505 lb. of this seed for Rs. 19-13-0. This is a very cheap rate and cheaper than the consignments we had before from Bethamcherla in Kurnool district.

(*d*) *Indigo.*—For want of imports in artificial indigo from Europe, a fresh impetus has been created amongst the ryots to cultivate indigo with the hope that the once lost trade in this dye would revive and better profits for its cultivation be realized. The demand for this seed at Nandyal rose to such a height that the supply was hardly able to keep pace with it. A grant of Rs. 500 was allotted to Nandyal farm to lay in seed for distribution amongst applicants and 15,992 lbs. of seed were distributed.

(*e*) *Paddy demonstration plot.*—The paddy demonstration plot at Nandyal continued as usual demonstrating single transplanting of paddy. The demonstration was a success in as much as we were able to get as good a crop as ryots do, using 18 lbs. of seed per acre against 70 or 80 lbs. in vogue.

(*f*) *Treatment of sorghum seed for smut.*—An attempt to expand this branch of demonstration work was made this year. A two-per cent. copper sulphate solution was prepared in the presence of several ryots and sorghum seed of both varieties (early and main) was steeped in the solution for about 15 minutes before it was sown on the field. Farm Manager M.R.Ry. M. Raghavulu Nayudu, conducted the campaign. Nine villages in Nandyal, Sirvel, Nandikotkur and Dhone taluks were tackled and seed for 179 acres of crop was treated. The Farm Manager personally conducted the steeping of seed in all cases.

(*g*) *Patimannu subtitute Experiments.*—These experiments are now being conducted in the deltaic portion of the Guntúr district in about seven different stations. As usual a green manure crop of indigo was sown mixed with sunn-hemp, but owing to the failure of the former for the second year artificial manure was again resorted to. Castor cake at the rate of 330 lbs. per acre and Superphosphate at 112 lbs. per acre were applied. ' At Zampani in Tenali taluk the experimental plot was washed away during the floods. Out of the remaining six experimental plots the results in four of them seem to be encouraging. As these have passed through their second year and are now in their third year course, it is yet too early to say anything definitely about these results.

Nandyal Agricultural Station.

Season.—Unlike the three years preceding, the annual rainfall was heavy, being 29·09 inches which is only about 3 inches less than 40 years' average. Though this amount was sufficient and satisfactory, yet its distribution was very irregular and unfavourable to most crops except cotton. During the south-west monsoon months, between June and September, a total fall of 21·61 inches was received and this was distributed over 64 days with several heavy downpours in the interval. Both cotton and sorghum were however sown in good time. Owing to this heavy and continuous fall during this period, indigo which was sown in July suffered and in the case of a single plot it had to be resown. Rains of the north-east monsoon were different in character. They amounted to 2·02 inches for the whole period, of which 1·20 inches was received on a single day and the rest distributed over six days. Dry weather prevailed during this period to a great extent. Consequently sorghum suffered heavily. The

farm land cracked deep, creating a necessity for repeated inter-culturings especially in the case of cotton.

Cotton.—The total area under the crop is 37·58 acres an increase over that of last year. It is, however, not possible to record the average yield of this crop as pickings is still being done. The average yield as estimated will approximate to about 260 lbs. per acre.

Sorghum.—This is second in importance on the farm occupying about 21·81 acres. This crop fared very badly on account of bad weather during the north-east monsoon period and its yield excluding single plant selections has been recorded to be only 299 lbs. per acre. This is less than half the average yield of the district, under normal conditions.

Bengal-gram.—The area under this crop amounted to 26·85 acres. This was put in at the right time. It started vigorously at the outset and promised to give good results. But owing to want of sufficient dew in the cold season, its growth was checked and an average yield of only 91 lbs. per acre was obtained.

Seed distribution.—The following quantities of seed were distributed from Nandyal Farm :—

Seed.	Lbs.	Quantity.
Cotton Plant No. 2	37,774	
„ Ordinary Sircar	2,392	
„ Cambodia	3,089	from the farm and 279 lbs. by the Farm Manager, Samalkota, credited to this farm account.
Dhaincha	2,507¾	
Wild indigo	580	
Cultivated indigo	15,992	

Implements.—Two applicants were supplied with cotton soil ploughs for a short period. Their lands were broken open to minimise the troubles from weeds. In both the cases they were satisfied with the work of the plough. One ryot loaned Sampson's Harrow from the farm and used it on his fields.

Visitors.—Distribution of cotton seed on the farm attracted several people to visit the farm during the cotton sowing period.

New works and improvements.—To provide more accommodation, the office room was extended at a cost of Rs. 473–9–4. Repairs to Farm Manager's and Assistant Farm Manager's quarters were undertaken and completed. The big forest rest-house situated east of the farm was handed over to the Agricultural Station on 28th May 1914 and the second rest-house near the farm will be taken over shortly. This new acquisition will provide accommodation for one of the officers of the farm staff which is badly wanted.

Sirvel Agricultural Station.

Season.—The south-west monsoon started late this year. Neither arika nor drill-paddy was sown till the end of July. A great portion of the rainfall fell continuosly during the months of August and September, checked the growth of the crops, and prevented after cultivation to a serious extent. In addition, the drought that prevailed during October, November and December coupled with the failure of water-supply, caused great anxiety amongst the ryots of the locality who suffered great losses at the failure of crops. On the farm no experimental work was done this year. Attempts to raise crops to test the initial fertility of the soils ended in failure owing to reasons stated above. One point, however, is worth putting on record in connection with this Agricultural Station and that is the success of the green manure crop (sunn-hemp) on the wet land. With the help of irrigation water from the canal, sunn-hemp at the rate of 28 lbs. per acre was broad-casted towards the end of July in about 15 acres of the wet land. Germination was satisfactory. The crop grew luxuriantly and the quantity of green stuff obtained when it was cut and trampled at the beginning of September amounted to 11,500 lbs. per acre. This was more than sufficient for the area on which it grew, while the total cost of production was only Rs. 6–3–2 per acre.

New works and improvements.—A third block (dry land block No. 2) of about 9·52 acres was taken over in June and fenced during the year. The construction of a manure pit, a cattle shed, an office, the sinking of a well and the erection of the rain-guage were all completed during the year. The building of a seed-store was commenced, but the work is not yet finished.

K. RAMASASTRULU NAYUDU,

4th May 1915. *Assistant Director of Agriculture, Northern Division.*

Administration Report of the Deputy Director of Agriculture, Southern Division, for the year 1914-15.

I have the honour to submit the administration reports of the Agricultural Stations under my charge.

I was in charge of the Southern Division for the whole period under report except for 20 days on privilege leave from 3rd June 1914 and for 17 days when I was on special duty in connection with the Madras Agricultural and Trade Conference which was held in December last. Mr. K. Ramasastrulu Nayudu was my assistant until 2nd June 1914 and acted as Deputy Director during my absence on privilege leave till 23rd June 1914, when he was transferred to the Northern Division; after that I was without an assistant until 4th December 1914 when Mr. R. Thomas, Probationary Deputy Director of Agriculture, was posted to this division to assist me.

With the exception of the following changes and transfers in my subordinate staff the work in this division has been uninterrupted and it has been possible to develop this along the lines already laid down.

Farm Manager M.R.Ry. K. Sankara Ayyar, on return from leave on 3rd June 1914, was posted to Madura district for the introduction of green manure crops on lands under the Periyar irrigation. He relieved Assistant Farm Manager, T. A. Krishna Ayyar, who was transferred to the Manganallur Agricultural Station taking the place of Assistant Farm Manager, K. Ramanuja Achari, who was transferred to the Northern Division.

Assistant Farm Manager, M. Raman, was transferred from the Koilpatti Agricultural Station to district work under Cotton Improvement on 9th August 1914 and has been working in the north of the Tinnevelly cotton tract where up till then the department had not done any organised work. His place was taken by the Assistant Farm Manager, Rajagopal, G. Mal, newly appointed. Assistant Farm Manager, K. Raghava Achari, was transferred from the Koilpatti Agricultural Station on 5th January 1915 to work under the Government Lecturing Botanist at the Agricultural College, Coimbatore, his place being taken by the Assistant Farm Manager, K. Gopalakishna Raju, who was transferred from the Central Division. Second-grade Farm Manager, M.R.Ry. K. Unni Krishna Menon, was transferred from the Taliparamba Agricultural Station to the Central Agricultural Station, Coimbatore, on 6th June 1914 and his place was taken by Assistant Farm Manager, M. K. Nambiar, from the Central Agricultural Station, Coimbatore. Rao Sahib M.R.Ry. A. Rama Rao was newly appointed as Farm Manager and was posted in charge of the Manganallur Agricultural Station. Most of these changes have meant putting officers of greater experience on to the more responsible duties of district work and filling vacancies of the Agricultural Stations with newly appointed and inexperienced officers. The development of district work in the neighbourhood of the Agricultural Stations has also greatly assisted in the training of newly appointed officers who have much to learn not only of the conduct of district work, but in their bearing and friendly relationship to actual agriculturists. They soon realise that what the ryot has learned by actual experience is not to be treated lightly and that their own knowledge of theoretical and practical agriculture can be greatly extended by a closer acquaintance with those who have been trained only in the school of experience.

It has this year been possible to again carry on district work in the Tanjore district, so far this has been mainly confined to the Mayavaram and Shiyali taluks. It will be remembered that great effort was made in the past in this and other taluks to introduce the practice of single seedling planting. This appears to have become fairly general for the time being, but has now been modified into what might be termed economic planting, *i.e.*, two to three seedlings planted together. The reason given for this shows in what a degraded position the agriculture of these taluks stand. It is stated that single planting although it gives increased yields for one or two years reduces the fertility of the land, which without manure cannot stand this increased drain; and that subsequent yields are less. It is difficult to understand how any farmer can take up such a standpoint, for, it must be abundantly evident that the increased outturn of grain much more than pays for the cost of manuring. At the same time it opens up a large field of work in the introduction of green manuring and better methods of manuring generally. Already in consequence of this years touring work by an officer of this department there has been a marked increase in the sale of green manure seeds. These sales, which amounted to 13,327 lbs. of Kolingi (Tephrosia purpurea), considerably exceeded our estimates and would have been still greater if further quantities of seed had been available.

On the West Coast, the district work is still conducted by the staff attached to the Taliparamba Agricultural Station. The area under Mauritius canes in the South Canara district again shows a marked increase and steps have been taken to introduce this into the Uppinangadi and Kasaragode taluks. The following figures, kindly obtained by Mr. Couchman, the Collector of the district, show that the area of improved canes has more than doubled in one year. Previous years' figures have been included for purposes of comparison.

Taluk.	Area of canes in					
	1913.	1914.	1915.			
Coondapoor	29·67	67·21	92·87 representing 68 villages.			
Udipi	34·40	89·59	228·88	„	57	„
Karkal	1·75	6·00	2·50	„	2	„
Mangalore	17·85	31·00	97·92	„	18	„
Uppinangadi	...	...	2·23	„	4	„
Kasaragode	...	...	·10	„	1	„
Total ...	83·67	193·80	424·50		150	

Mr. Couchman writes that beyond the extension of cane to Uppinangadi and Kasaragode taluks there is not much more that need be done to assist this crop.

With reference to the figures given above he adds that the largest area under these canes is in the village of Bangra-Kulur, Mangalore taluk, where there are forty acres. The next largest area is in Uppur village near Udipi with 37·60 acres. Of this total area all is red Mauritius except twelve acres of Barbados 208. This latter is a promising variety and is likely to increase on the islands where there are fewer jackals. Much of the credit of this work is due to Mr. Couchman, who keenly interests himself in the work of this department and in the improvements of the Agriculture of this district.

At the request of the Collector, steps were taken to introduce the bullock mhote in place of the South Canara picotta. This latter water-lift makes a great demand on human labour, which owing to the rise in price of such labour, renders the cultivation of paddy in the dry season very speculative. Moreover, the increased area under cane in many places renders the introduction of more efficient means of lifting water imperative. Nine such mhotes have been fitted up for farmers this season. All the parts of the mhote have been made in the district itself and buffaloes and cattle have been trained to the work.

Trials of daincha as a green manure crop last year in the South Canara district were fairly successful in spite of the failure of the April-May rains; and a considerable extension of the practice has followed the season. A small quantity of seed was, last season, collected by the owners of these crops and additional requirements were supplied and sold by the department. These crops are chiefly in the neighbourhood of Mangalore. This work is of the first importance, as the coast tracts are hard put to, to obtain green leaves for manuring the wet lands.

A certain amount of progress has been made in the improvement of paddy cultivation in Malabar. Trials made with cowgram as a green manure were disappointing this season owing to the failure of the April-May rains on which the crops were dependent for water and only one or two demonstrations proved successful. Such failure is the exception, however, and not the rule. Further trials will again be made this sowing season. For the same reason the germination of paddy seed-beds which are also dependent on these rains was everywhere sparse and thus more economic planting had perforce to be adopted throughout the district. In spite of this many members of the village societies, started the previous year, testify to the advantages of economic planting. This success must very largely be attributed to the better preparation and manuring of the seed-bed which is insisted on by the department as one of the essentials to success. There was abundant testimony this year to the benefit derived from using selected seed, which was the produce of the crops grown on the Taliparamba Agricultural Station and, for this coming season, most of the seed available on the Agricultural Station has been sold to members of these village societies. This is in spite of the fact that the price for the seed has been fixed above the market rate in order that those who purchase it will better appreciate its value.

Cane cultivation in Malabar has received a considerable impetus owing to the rise in price of the jaggery and is being cultivated in 13 different centres in the district.

The extension of intensive dry land cultivation is slowly spreading, though as mentioned last year it has received a considerable check on account of the fall in the price of ginger. Chillies, however, are still a profitable crop and the cultivation of this is extending. Over 10,000 seedlings besides 2½ lbs. of seed were sold from the Agricultural Station last year. The residual effects of the manures applied to Chillies, Ginger and Turmeric have proved to be very considerable and the subsequent cereal crops have been known to yield as heavily as good wet lands.

The officers attached to the station have, between them, been 365 days on tour.

Work in the neighbourhood of the Koilpatti Agricultural Station has continued on the lines mentioned last year. The scope of the work has been enlarged and a new circle has been opened which includes the cotton tract between Sivakasi, Virudupatti and Satur. For the proper control of the work, the black soil tracts have been divided into four circles one of which is worked by the officers attached to the Koilpatti Agricultural Station and the other three are each under the charge of an Assistant Farm Manager. Owing to the rapidity with which the work of introducing drill cultivation was expanding, it was felt to be necessary to further divide the work; and each circle was this year divided into four or five divisions. Each division contains from about 8 to 12 villages where work was contemplated or already in

progress. A temporary head cooly was appointed to each of these divisions, these being selected from the best coolies trained in previous years. Each division was allotted coolies, implements, etc., and the Head cooly was responsible to the Assistant Farm Manager for their proper distribution to wherever these were wanted. This has always been a difficulty as sowing can only be done when the soil is fit after rain and the unequal distribution of the rain will often allow of work in one village while it will be impossible in another. Except in the new circle all coolies employed were drawn from the villages in the division in which they were to work. Those who required training were trained on the spot and it was thus possible to get a much better class of cooly, many of them being sons of respectable farmers. The results of this organisation have been entirely satisfactory.

It is necessary to again plead the excuse of unfavourable weather conditions hampering the work. The season everywhere was late and the soil seldom got a chance to dry sufficiently to sow. This was especially unfortunate in the new circle around Satur. Here usually sowing is over by the beginning of October, but this year it was continued right into November. In the south the rains were extremely heavy and so wet were the soil conditions that the cotton crop had in some places to be sown three times before a stand was obtained. The last sowings were not completed till the beginning of January. In spite of this the area under drill cultivation increased from 7,117 to 11,329 acres. Work extended to many new villages as well as in villages where improved methods of cultivation had already been introduced. It is very encouraging to see how ryots adapt these implements to suit the season. In one village implements for inter-cultivation and even the country plough were used to open up and dry the land instead of being used to merely loosen the surface in order to conserve soil moisture. In other villages ryots were most thorough in their after-cultivation and when questioned as to the reason of their zeal stated that previously many had noticed that this after-cultivation greatly improved the land for the succeeding cereal crop.

The crops raised from unit strains have not in all cases given results as good as were expected. The seed distributed in the new circle around Virudupatti has been especially disappointing. In the previous season Mr. Steal had given this cotton a trial and he writes that this yielded at the rate of 452 lbs. per acre over an area of 13·89 acres. This year, however, the yields of crops raised from seed of the same strain will not, it is estimated, yield more than if as much as 250 lbs. per acre. In the initial stages, this crop was very promising, but many of the flower buds and young bolls shed before they matured. It is very probable that the heavy rains in this year caused the plants to develop a surface root system which would prevent them withstanding the effects of dry weather when this set in. The superior germination of the seed also was a drawback. The plants were much too close and it was noticed that whenever the plants had sufficient space to develop shedding of buds and young bolls was not so severe. Another unit strain (Company No. 3) grown in this tract is promising although it has not done as well as was expected. Here again the season was against it. It is unfortunate that this has happened in the first year of our extension of work to this area. From Koilpatti southward the unit strain (Company No. 2) grown on seed farms as well as by private growers is doing well and has given great satisfaction. Even here, however, in a few villages the crop has shown a tendency to run to vegetative rather than reproductive growth on account of the very wet season. It is estimated, however, that this will yield 25 per cent. more than the ordinary karunganni. The ordinary karungunni cotton of which a bulk selection is each year made on the Kolipatti Agricultural Station has also done very well this season and is cropping heavily. There has been a very considerable extension in the area under karunganni. Twenty-five different villages arranged for co-operative ginning of kappas for seed purposes and over 600 pothies of seed were stored by them for sale. Most of this was sold for seed, though some appears to have been used for cattle food. Besides this many villages had not sold their cotton when the war commenced and they therefore had to arrange to hand gin their kappas. Much of the seed thus obtained was available for seed. Four hundred and seventy-five pothies or about 117,400 lbs. of seed were sold by the department or issued for growing on seed farms. All the officers responsible for this cotton improvement work have shown great enthusiasm and energy, and to them is due the credit of what success has been achieved this year.

In the Periyar irrigation tract two full-time officers have been employed; one with headquarters at Sholavandan and the other at Madura. Their work has been confined chiefly to the introduction of green manure crops, but, besides this they have endeavoured to improve the cultivation of the paddy crop generally. The work around Sholavandan has developed very satisfactorily and considerable areas of both Daincha (*Sesbania aculeata*) and Kolingi (Tephrosia purpurea) were grown, the former on old wet lands and heavy soils and the latter on the lighter new wet lands. Speaking generally, Daincha has given marvellous results on lands which are saline while on sweet lands its effect is not very marked. One case was reported where the yields from saline land was five times as much as the land had ever been known to yield before. Such results are gratifying but at the same time they do not always help on the work. Ryots who own sweet land very naturally think that if a green manure crop gives such results on saline land it ought to do much better on good sweet land, but they do not realise that very often salt lands are abundantly supplied with plant food which as long as their mechanical texture is so poor and drainage practically non-existent,

the paddy crop cannot make use of. These results therefore seem to point to the fact that the value of green manure crops is very largely mechanical.

Trials are being made with superphosphate applied in small quantities as a supplementary manure to green manures on sweet lands. Trials also are being made with manuring the green manure crop with superphosphate by which means it is thought that the green manure crop might grow more vigorously and at the same time take up the phosphate which, when the green manure crop was ploughed in, would be liberated for the use of the succeeding paddy crop. Work in the Sholavanam circle is much more advanced than in the Madura circle. This is very largely due to the fact that work was concentrated within a small area. This circle is the apex of the triangle forming the Periyar tract and at first very little progress was made here owing to the proximity of hilly tracts where green leaf was procurable. It was decided therefore that it was necessary to make this circle much similar to the Madura circle so that more detailed work could be done, and the results of this have been eminently satisfactory. It also points to the necessity there is for a large increase in subordinate staff if definite results are to be achieved. Recent sales of green manure seeds in the Madura circle show that the work here is getting a hold and it is expected that considerable progress will be made if the work is undisturbed. Much depends on the officer in charge getting to know the circle and being on friendly terms with the villagers. Early work in this circle was much handicapped by the zeal, which was often genuine enough, of absentee landlords who wished their agents to work with the department in the trial of green manure crops ; but, as the success of green manuring is adverse to the immediate interests of the agent, such trials are in most cases bound to end in failure. During the latter part of the period under review this work in the Periyar has been under the charge of Mr. R. Thomas.

District work in the Coimbatore district continues to expand. The introduction of single planting of paddy in the Bhavāni valley has been very successful and large areas under this system may be expected next year. There are still some reaches under the Kodiveri anicut where this system has yet to be introduced, but where tried last year the spread of this system should now be largely automatic. Some progress has also been made in the Cauvery valley, while similar work has been continued in the Noyil valley near Coimbatore and has been started in the Amravati valley both in the Udamalpet and Dhārāpuram taluks. Trials with green manure crops are also being made in all these places and it should be possible next year to report on this success.

Trials with fish manure had to be restricted owing to the supply of this commodity from the West Coast being again a total failure. Many ryots who had applied for manure could not be supplied, while the supplies reached others when it was too late to use the manures for the crops for which they were required. From the fact that ryots were willing to pay considerably more than the current rate for this manure, it shows that they realised its value from previous trials. Evidence seems to show that this manure is of much greater value when applied to heavier types of soil.

The officer in charge of the work in this district has also had charge of the green manure work in the Trichinopoly district. This was started at the instance of the Collector who asked, in the interests of both the people themselves and of the reserved forests, that attempts should be made to introduce green manure crops in those parts of the Musiri and Perambalūr taluks adjoining the Pachamalai hills. In the Musiri taluk, daincha as a green manure crop seems now to be firmly established. Here the green manure crop is raised mixed with cumbu and irrigated when necessary from wells. Although the daincha, which in some cases grows as high as 12 to 15 feet, considerably decreases the yield of cumbu, the value of the green manure crop greatly outweighs the loss of grain. It enables the wet lands to be manured expeditiously as soon as water is received and thus the paddy planting is soon completed in good season. It saves the expense of carting from the forests which is often no small item, even when only the damage done to carts and the cost of maintaining expensive cart bullocks is taken into consideration. Last year over 1,000 acres were grown with daincha in these two taluks and very often the growth was so great that the crop from one acre was ample to manure two or three acres. In Musiri taluk the ryots now make their own arrangements to collect seeds and are thus independent of the department's help. In fact, this year the department have been able to buy up their surplus stock for distribution elsewhere. In Perambalūr taluk no seed was collected and the department has again to render assistance by selling seed there. As, however, the conditions under which the crop is grown are similar to those in Musiri, this tract should be able to supply itself with seed from next year forwards.

Trials with superphosphate as a supplementary manure to the green manure crop are being tried in the coming season.

In addition to this organised work, a certain amount of success is acknowledged by correspondents who have acted on the written advice of the department. Wherever such response is met with endeavour is made to send an officer of the department there to follow up any work started, and it is thus possible to establish what might be termed a clientele which will pave the way for the time when organised work throughout this division will be possible.

During the year under report 1,298 letters have been received from private individuals asking for advice, etc.

Koilpatti Agricultural Station.

Season.—The hot weather rains were favourable and resulted in a good summer on second season picking of cotton. The main season, however, was again late. Except for an unusual rain of 1½ inches in August which was of no value for agricultural purposes, there was no fall of rain sufficient to be of use till the end of September and with the aid of this the red soil crops were sown. The black soil crops were practically all sown in October, but the season was very unfavourable: there were 29 rainy days between October 2nd to November 10th and continual cloudy weather. Anyone who has experience of black cotton soils will realise the difficulties to be contended with. A few of the crops had to be resown, while others such as several of the pulses could not be sown at all. It was not until the middle of November therefore that any weeding or essential operations in the after-cultivation of the crops could be done. Weeds had a free field in which to develop and these combined with the wet soil conditions greatly checked the growth of the tender crops. The fine weather in the later part of November was, however, fully utilised, and the crops were just recovering from the excessive rain when another spell of wet weather occurred in the beginning of December, which again stopped all field work. Cumbu especially suffered from the lack of inter-cultivation while a heavy fall of rain at Christmas time just caught the crop when in full flower and as a result the grain yield was still further reduced, and an average of only 100 Madras measures (about 300 lbs.) of grain was obtained. In many other parts of the district the yields were relatively much less. The cotton crops also had suffered severely from the weather conditions, but as this improved they made rapid development; with abundant moisture in the soil, this development was too luxuriant and the crops were unable to maintain this standard as the soil became drier. Fortunately a heavy rain in the end of February saved the situation for the time being; but the crops had never really made a deep root system and thus could not stand the dry weather conditions which were bound to follow. This was shown by the heavy shedding of buds, flowers and young bolls, which occurred as soon as the hot weather commenced. On the Agricultural Station this was not so severe as might have been expected but outside, especially north of Koilpatti the crops have suffered severely. Crops which looked as if they would give 500 lbs. of kappas have, in some cases, not given more than a quarter of this amount. On the red soil the rains were much too copious. The soil for weeks on end was thoroughly water-logged and as the land is situated on the foreshore of a tank it was impossible to remedy matters. Weeding was impossible and these soon gained the mastery of many of the crops. Nothing could be done to save them as it was impossible to get on to the land. When fine weather did prevail in, the land had set hard and weeding proved a very costly matter. The Cambodia cotton and Cow peas were the only crops which really recovered to any extent.

Black cotton soil work.—The introduction of a double furrow disc plough has added much to the efficiency of the cultivation and the consequent cleanness of the land. This has entirely replaced the "cotton soil" plough. It is of lighter draught and does nearly twice the amount of work. The adjustments make it possible to accurately set the implement to various depths of ploughing. As already mentioned in one of the annual reports of this station, it has been found quite possible to keep "hariali" grass in check by surface manuring the fodder cholam crop and by deep ploughing immediately after the harvest. This method has been adopted on all land on which fodder cholam had been grown and these lands are now practically free from this weed. It was necessary here and there to dig out isolated plants which were found not to have died but this was accomplished without any difficulty as the soil had been pulverised by the ploughing. The same plough set at 6 inches has been used for fallow ploughing after the removal of the recent cumbu crop. Thus it has been possible to get much of the fallow ploughing done before the soil was moist enough to allow the country plough to do the work. This implement, known locally, as the "Chatti" plough, has attracted considerable attention in the neighbourhood and an additional one has been purchased by the department which will be hired out, with a view to subsequent purchase, to the Avalnattam Co-operative Agricultural Association.

Considerable progress has been made in the protection of the fields from wash. Most of the field drains as well as the main drain have now been revetted. Washes do still occur, but not to the same extent as formerly since the revetment has greatly improved the levels of the fields.

The introduction of Periamanjal Cholam from Coimbatore has meant a large increase in the fodder supply. This variety has now entirely replaced the local Irungu cholam on the farm as a fodder crop. It not only gives a considerably heavier yield, but is a much more leafy fodder and therefore more palatable. Several ryots obtained seed from the department last season and all speak well of it and there has been an increased demand for seed for sowing in the next season. The only objection to this is that seed has to be imported from Coimbatore as this variety does not set seed properly in Tinnevelly.

The work of cotton selection continues on the lines already laid down.

Company No. 1 which was put out last season in the district has not proved a success. It gives a very fine lint and reports on its spinning value compare it very favourably with

imported American. The acre yield, however, has proved disappointing and only averaged 250 lbs. per acre on the seed farms. At Virudupatti, however, the yield averaged 450 lbs. This strain was therefore issued in that tract this year. But though very promising when young; it has proved most disappointing. The season was very much against it as the rains were much too heavy to enable the crop to develop a deep root system.

Two other strains were put out in the year under report. One named Company No. 2 was issued in the south of the tract and being an uneven ripening cotton, has responded very well to this wet season. Spinning reports say that this cotton is as good as the preceding one in all respects, except that the colour is not quite so good. The other strain put out this year and named Company No. 3 is also promising and in a normal season should do very well. So far, however, its cultivation has been confined to seed farms. It is too soon yet to say so what the acre yields will be. The largest seed farm of this is near Koilpatti and the yield is estimated at 500 lbs. per acre of which 375 lbs. per acre has already been picked. This is an even ripening cotton with a ginning percentage of over 33 per cent. and it is hoped that this will prove useful in supplanting the jari or pulichai cotton, an inferior variety which is now largely grown in the Rāmnād District. Spinning reports say that this is not quite so good as Company No. 1, but it can be used for spinning 40s. The bulk selection karunganni has done remarkably well this year throughout the district and promises to yield a heavy crop.

New works.—Quarters for an Assistant Farm Manager have been built during the year under report and a kappas shed has also been put up. This latter was necessary as all seeds farm kappas is now ginned on the Agricultural station during the year. 780 pothies (1 pothie = 246 lbs.) of seed-farm kappas, inclusive of the crops grown on the Agricultural station itself, were ginned.

The work this year has been exceptionally heavy on account of the increasing district work in the neighbourhood of the Agricultural station, all of which has to be attended to by the officers stationed here. Farm Manager M.R.Ry. N. S. Kulandaiswami Pillai deserves special mention for his work which has meant detailed supervision and constant touring. The Assistant Farm Managers though only recently appointed have also done good work and have spared no pains to learn the work and to assist the Farm Manager in his duties.

Manganallur Agricultural Station.

Season.—There was a certain amount of delay in planting the first crop paddy, i.e., the kuruvai and "udu" * crops owing to water not being received in the channels till the first week in July. The result of this late receipt of water was that the kuruvai was not ready for harvest until the heavy rains of the north-east monsoon were received and the ottadam (the late crop of udu) which was only cut during these heavy rains, could not benefit by them for its second growth. Thus there was a considerable loss in yield from the kuruvai both from shedding and sprouting in the field, while the quality of the grain stored was lessened owing to the very wet weather conditions at the time of harvest, and the difficulty of drying threshed grain. The ottadam subsequently recovered somewhat in condition as good rain was received early in December.

A heavy fall of rain in August did serious damage to recently sown samba seed beds. As a result of this, the supply of seedlings was found insufficient for the whole samba area to be transplanted and seedlings from outside had to be purchased. This proved a useful demonstration which showed the great superiority of our seedlings raised from selected seed and those grown by ryots outside from their own seed. The difference in yield amounted about 18 per cent. in favour of our own seedlings when compared with yields of adjoining fields under otherwise similar treatment and manuring; except for this the season was very favourable to the samba crops.

Crops.—Owing to the uncertainty of the water supply both at the beginning and end of the season the greater part of the double crop area was planted with "udu" instead of with two crops. The "udu" has been much the more profitable system of cultivation for besides saving the cost of second crop cultivation, the yield from a block of over seven acres has this year been 1,231 Madras measures (799 kuruvai and 432 ottadam) against an yield of 997 Madras measures (681 kuruvai and 316 samba) obtained last year. This does not mean to say that "udu" is always the more profitable system but under local conditions with the uncertainty of water-supply at either or both ends of the season it certainly is.

The quality of the crops throughout the farm and of the sample of grain obtained this season was a marked advance on that obtained the previous year. By a bulk selection all varieties of paddy now grown are true to type and this year the crop has been stored and is being issued for sale to the public as seed grain. Several unit selections are under observation and some of these appear quite promising. The examination of these, however, entails a considerable amount of work on the staff. Of varieties introduced none of them appear to be superior to local ones. This is probably due to some extent to the soil conditions under which the crop is grown. A change from ordinary wet land to a heavy delta

* A mixture of a three and a eight month crop.

soil which lacks free drainage seems a probable cause for this. For example this year's sadai samba crop was not only inferior to that grown last year from seed imported from the adjoining district, but also took considerably longer to mature. If this conclusion is correct it seems clear that any attempt at improving existing varieties either by selection of plant breeding should be done on the spot and arrangements to this end are being made in co-operation with the Government Economic Botanist.

The manurial experiments started last season and continued this year on more carefully selected plots, have not given any definite results as shown by crop yields; but from observation of the growth of the crop it is evident that as regards manuring the main question apart from improving the mechanical texture of the soil, is the supply of phosphatic manures, and further experiments to determine what quantities can be most profitably applied will be commenced this coming season.

The difficulty of growing green manure crops on these heavy delta soils has not yet been solved. It is possible to get a good germination of these by sowing in the moist ground before the paddy harvest, but without subsequent rain it is impossible to raise these crops owing to the deep cracks which form immediately after harvest and which rapidly deplete the soil of its moisture besides tearing asunder the roots of the green manure crop.

The difficulties attending the harvesting operations have not diminished with the increase in the number of experimental plots, which have all to be harvested separately; although a considerable area was cut, bundled and stacked for subsequent threshing.

The disease known as "surai" and reported to be due to a mite caused a certain amount of damage. This was specially noticeable in the sadai samba crops. The caterpillar, which attacked the ripening crops last season and which caused so much loss, did very little damage this year. Steps were taken to keep the field bunds cut as it was noticed in the previous year that these caterpillars fed freely on the flower heads of natural grasses and it was thought that, if these were prevented from flowering, the caterpillar would be deprived of its food on which it and previous generations could exist till the paddy crop ripened. Whether this was contributory to the lessened damage, it is difficult to say.

Taliparamba Agricultural Station.

Season.—This has been peculiar, but on the whole favourable to crop production. The hot weather showers of April-May failed entirely, but fortunately the early part of the monsoon was irregular and instead of continuous rains and cloudy weather, there were heavy showers with intervening bright weather. In July the rainfall was much above the average and so also in August there being really no break till the third week in September. The September rains were exceptionally good while showers continue on into November and December. The whole season therefore was as if it had been a month late. The rainfall for the year was 147·57 inches and more than ·30 inches of rain fell on 121 days. This compares very favourably with an average of 139 inches and 84 rainy days.

Wet lands.—The failure of the hot weather showers necessitated irrigation of sugarcane right on until June and for the same reason the paddy seed beds, which are rain fed, suffered severely, nor was the germination as good as usual. The bright weather in June, however, gave the newly-planted crops a good start and the yields were considerably better than last year. The grain has all been sold for seed at an enhanced rate and those who have grown it in the past speak highly of its superiority over local seed. Of the canes grown, B. 147 continues to do well and sets of this have been distributed to selected cultivators both in Malabar and South Canara for further trial. Another cane, a sport of Red Mauritius which was found in Malabar, is also promising. Except for these two and Red Mauritius, B. 208 and a few varieties grown for the sugar-cane expert, all other varieties tried have been discarded as unsuitable for West Coast conditions.

Pepper gardens.—These suffered very severely from the seven month drought from November till May. The last two months, when only 1 inch instead of about 8 inches of rain fell, were especially trying owing to the high temparature of the air and soil. The lack of rain at this time not only checked the pepper vines, but also delayed the fresh growth of the shade trees and thus the vines felt the dry hot weather all the more severely. When the monsoon commenced, the vines had lost all their leaves, a condition which has never occurred before since the Agricultural station was opened. Thus the vines had not only to form new leaves but had to form its fruit in the monsoon. Fortunately the bright weather in June enabled them to do so and this coupled with the good rainfall of the north-east monsoon which continued until December, resulted in a record crop. Two points specially noticed which presumably were due to the season were:—

(1) That "pollu" (a disease caused by the larva of a flea beetle boring into the berry) which usually causes much damage was hardly seen this season.

(2) All vines which received heavy manuring with concentrated manures except in the case of a few moist low-lying plots gave reduced yields. This would have been expected as naturally such plots would develop more of a surface root system and would therefore feel the effects more of, and take longer to recover from, the prolonged dry weather. The fact that

the pepper harvest did not commence until six weeks later than usual shows how severely the vines had suffered.

It is fortunate that, at a time such as the present when most West Coast produce is suffering from low prices, the pepper should have yielded so well and the price also should be satisfactory.

Dry land crops.—It was not possible this year to get these crops established before the monsoon commenced. It was impossible to time the sowing of ragi seed beds properly. Sowings were made at the usual time, but as rain held off fresh sowings were made. Planting could not be done till well into June and the former seedlings were by that time too old while the later sown seed beds were still too young. The result was that the yields were only a little more than half those obtained in the previous year. Both ginger and turmeric should have been well established by the commencement of the monsoon, but neither of these crops showed above ground when this commenced. Fortunately the subsequent weather conditions favoured the crop and it made a fairly good recovery although many sets failed entirely and there was not a full stand. Ginger is still being grown although there is no sign of the market improving. At present prices it does not pay to grow and this must have been the cause of considerable hardship in the Ernad taluk which is the home of the West Coast ginger crop. Chillies have again proved a valuable crop and have done well in spite of late planting. Having now proved the value of intensive dry cultivation in Malabar, trials with concentrated manures have been arranged for this coming season in order to see how far it will pay to supplement the local manure supply.

The district work which is conducted by the staff of this Agricultural Station has already been referred to. This is continually on the increase. Interest in agricultural matters seems to be awakening in Malabar and many requests are received asking for local advice on agricultural matters. The Collectors of the West Coast districts have continued to interest themselves in the work of this department and their help is gratefully acknowledged.

His Excellency the Governor's visit to the Agricultural Station has left a deep impression in Malabar and has aroused considerable interest among the agricultural classes in this Agricultural Station. People naturally infer that if His Excellency took so much trouble to visit an out of the way place such as this is, there really must be something worth seeing and learning there.

H. C. SAMPSON,

6th May 1915. *Deputy Director of Agriculture, Southern Division.*

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, CENTRAL DIVISION, FOR THE YEAR 1914–15.

Mr. G. D. Mehta, Extra Deputy Director of Agriculture, continued to be in charge of the division throughout the year with the exception of some ten days in March 1915 when he availed of casual leave. He was then relieved by Mr. R. Thomas, Probationary Deputy Director of Agriculture. The Divisional head-quarters were transferred from Cuddalore to St. Thomas Mount, Madras, on July 5, 1914.

2. In regard to district work a Farm Manager who devotes all his attention to district work has been stationed at Chittoor for the past three years; another at Chingleput since August 1914; and a third at Palur since February 1915. In previous years the district work has been largely confined to—

(1) Economic transplanting of paddy;
(2) Distribution of seeds for greenmanuring crops on paddy land.

But during the year under report a number of subsidiary lines of work have been taken up, the most important being—

(*a*) Improvement of sugarcane cultivation and jaggery making;
(*b*) Distribution of indigo seeds;
(*c*) Organization of cattle breeding associations;
(*d*) Extension of area under Cambodia cotton;
(*e*) Assisting in management of Criminal Settlements and other lands;

In addition cropcutting experiments have been conducted as usual.

The green manuring work had reached a scale where it would be practically impossible for one man to deal with it satisfactorily and at the same time continue extending the work in fresh tracts.

3. The work done at Palur, the only agricultural station in the division, is dealt with separately in this report.

4. The season has varied considerably within the division. Rains were excessive in the southern tracts (72 inches being recorded at Palur) while the average for the year for the Chitoor district works out to about 30 inches. The unfavourable season in the northern part of the division has very appreciably affected the progress of work there. The absence of timely rains curtailed the area which might have been transplanted with single seedlings

and a fairly extended period of drought coupled with a very late south-west monsoon did much damage to those of the greenmanure plots that had succeeded in germinating.

5. But what has affected the cultivation of crops considerably more than this year's climatic conditions is the unprecedented state of the market caused by the European war. Thus the groundnut trade has received a terrible check (the market at the time of writing continues to be very dull and shows no immediate signs of recovery); the indigo dye industry is endeavouring to come into its own again; cereal grains are quoted at very low rates—paddy being 30 per cent. below pre-war prices; sugar is sold at enhanced rates, the jaggery market adjusts itself accordingly and the area under sugarcane in consequence shows prospects of considerable increase.

6. It is impossible to ascertain the actual area where economic transplanting of paddy has been conducted. The practice is very common in South Arcot district and it is estimated that some 10,000 acres have been transplanted with single seedlings in that district alone.

7. The appended table gives the quantity of greenmanure seeds distributed within this division in the course of the year. The total amounts to 19,836 Madras measures, sufficient to sow 4,262 acres:—

Variety.	Depot.						Total.	
	Palur.		Chinglepnt.		Chittoor.			
	M.M.	LBS.	M.M.	LBS.	M.M.	LBS.	M.M.	LBS.
Sunnhemp	1,768	5,525	146	456	1,509	4,716	3,423	10.697
Wild indigo	8,882	29,607	1,750	5,833	999	3,330	11,631	38,770
Daincha	1,971	6,898	441	1,543	1,034	3,619	3,446	12,060
Indigo	..	...	...	...	336	1,092	336	1,092

It is a significant fact that practically all this seed has to be imported into the division from outside sources. Thus Bengal daincha seed is obtained from that Presidency. Wild indigo from Tinnevelly and Rāmnād, and sunnhemp from Gōdāvari.

With an ever increasing demand for greenmanure seeds it rests with this department to prove that growing these crops for seed purposes to supply the local market is a paying concern. With this object in view the various green manures have been experimented with on the farm. To date but little success has attended our efforts. The experiments are being continued.

8. (*a*) Though enterprising individual ryots in this division have in past years hired trained men from the Central Farm at Coimbatore to make furnaces for jaggery manufacture, it is only in the present year that the construction of improved furnaces for demonstrational purposes has been made a definite part of the programme of a district officer. During the year five furnaces were constructed after the improved method. Of these, three were constructed to fit the local pan which is round bottomed and very heavy and which can make one and a half maunds of jaggery at a boiling; and two constructed to fit the improved, light weight, Coimbatore pan which can turn out at least three maunds of jaggery at a boiling. By using the improved furnace the fuel necessary for the boiling may be reduced by one-half if the Coimbatore pan is used and by one-fourth if the local pan is used. One bandy load of fuel is commonly used locally to produce one pothie (=¼ candy) of jaggery. Calculating the outturn of jaggery at ten candies per acre there is a saving of five loads of fuel which at Rs. 3 per load indicates a gross profit of Rs. 15 or Rs. 30 by using the local and Coimbatore pans respectively. From this should be deducted the wages of one additional cooly at Rs. 3 per acre of cane crushed, thus leaving a net profit of Rs. 12 and Rs. 27 respectively. A trained jaggery maker from Coimbatore was engaged for about two months to attend to this work.

(*b*) Another equally important improvement in regard to sugarcane cultivation which is receiving attention is the substitution of the ridge and furrow system of planting for the local haphazard system of planting on the flat. Figures for the area cultivated according to the improved method are not available. Around Palur and Nellikuppam where sugarcane is extensively cultivated this practice is commonly adopted.

(*c*) Sugarcane cultivation in South Arcot district has received a considerable impetus through the agency of the East Indian Distilleries Company at Nellikuppam a few miles from Palur. Their agent Mr. Neilson, reports concerning the area under cane in the Nellikuppam locality that "over an area of nearly 600 acres under cultivation for the present season (1914–15)[2] I estimate about 20 tons of cane per acre which should yield approximately 1,500 tons of jaggery. The local area under planting for this season is about 1,800 acres." This is of interest in denoting the considerable increase in sugarcane cultivation which may be expected if present prices of jaggery rule for an extended period. Jaggery is now selling at Rs. 40 to Rs. 45 per candy (500 lb.) as compared with Rs. 25—Rs. 30 last July; and even at pre-war rates a minimum profit of Rs. 150 per acre could be normally expected by the cultivator.

(*d*) In regard to the distribution of sugarcane setts the Palur Farm has almost entirely ceased to act as a distributing agency owing to superior facilities enjoyed by Messrs. Parry & Co., to whom we are indebted for having undertaken to do the work. There has been such a considerable increase in the local area under sugarcane that it was practically impossible for the department to meet the demand. Provision is however being made at Palur to meet part of next year's prospective demand.

9. A rise in the price of indigo dye was anticipated immediately the war broke out. Provision was made by the department, without interfering with local enterprise, to acquire all the available indigo seed to meet the prospective local demand. A consignment of 2,342 Madras measures was almost immediately disposed of. No further supplies could be obtained. Purchasers have expressed their satisfaction with the germination of this seed. It appears however that some unscrupulous tradesmen have dumped on the market seed of doubtful age and germinating capacity, and the consequent complaints are numerous. In the course of the season the local price of seed rose from six annas to one rupee per Madras measure. A departmental leaflet on the cultivation of indigo for dye extraction was duly prepared and distributed.

10. Attempts were made during the year to organise Cattle Breeding Associations in three different localities,—with what success it remains to be seen.

11. Previous to the outbreak of war the extension of the area under cambodia cotton was a definite part of the programme of the Manager stationed at Chittoor. Subsequent to that date propagandist work regarding cambodia cotton has been temporarily discontinued. Four hundred lbs. of seed were distributed during the year.

12. Work normally expected from the district officers has been somewhat taxed by frequent visits of inspection to a Criminal Settlement at Madanapalle and to the lands of the Raja of Kanaparthi who has recently undertaken to cultivate a fair amount of his land originally lying waste. The Palur staff likewise inspected the Criminal Settlement at Kammapuram. Cropping schemes are drafted and the Agricultural officer concerned pays frequent visits to see that the proposed scheme is adhered to Some difficulty has been experienced in the case of the Criminal Settlements owing to the frequent change of Managers,—most of whom know but little about farming. Ten such visits of inspection by the farm officers at Palur and nine by the Farm Manager, Chittoor, were made in the course of the year.

13. Twenty-four crop cutting experiments were conducted by the subordinate officers of this division.

Palur Agricultural Station.

14. *Season.*—This year the farm enjoyed a rainfall of 72·6 inches well distributed over 86 days as compared with an average for the past ten years of 52·6 inches. Though the rainfall was excessive the cyclonic winds which are common to this tract were much fewer and less disastrous than ordinarily. Continuous rains for extended periods proved very beneficial to such crops as paddy and irrigated groundnut which gave record yields; but lack of drainage facilities told considerably on the rainfed groundnut; some of the canes varieties, the onion crop, Cambodia cotton and on Daincha grown for seed purposes. Advantage was taken of the unusual rains of January to sow indigo for dye extraction and gingelly.

15. *Experimental work.*—The experiments conducted were mostly in continuation of those of previous years. Reference is here made to those which have furnished data of interest during the year.

(*a*) *Groundnut varietal tests.*—Most of the varieties are exotics introduced by the department. Varietal tests are being conducted under both dry and irrigated conditions. In the rainfed tests the West African variety heads the list of averages though it is surpassed by Barbados from Ceylon for the year under report. Madagascar is another promising variety, and it is of interest that this variety and the West African both take a high position in the irrigated tests also. Local Mauritius which is at present by far the most popular variety in the Presidency retains its position at the head of the irrigated varieties but it takes sixth position as a rainfed crop.

(*b*) *Greenmanure crops grown for seed purposes.*—Up to the present greenmanure crops grown for seed purposes have failed to give satisfactory yields. The work is in its initial stage and conditions of season, soil, drainage, rotation, and immunity from insect attack have all to be considered and the best conditions ascertained separately for each variety of greenmanure.

(*c*) *Paddy varieties-first crop.*—The local varieties grown in the first crop season are generally very coarse grained. To determine if these may be supplanted by superior paddies a number of varieties have been introduced from the Central Provinces. Almost without exception the time these take to mature is too long to allow of their being grown as first crop paddies, for by so doing it is feared that the second crop paddies would be so displaced from their normal period of transplanation as to affect the yield. This year the season was favourable and high yields were obtained. *Parewa* has done best (3,898 lbs. per acre) which with *Chitrakali* have surpassed the popular local *Swarnawari* variety in point of yield.

(*d*) *Paddy varieties-main crop.*—Here, again, the yields were heavy. *Sadaisamba* comes first in point of yield both as regards weight and volume. Other varieties which have given good average yields are *Molagusamba, Vellaisamba* and *Poombalai. Poombalai* has an additional merit in that it takes a fortnight less to mature than the other varieties, but has the disadvantage of shedding its grain rather badly. In point of yield it takes second place.

(*e*) *Sugarcane varietal tests.*—On analysis the canes were found to be unripe, so a lapse of one month was allowed to pass before they were harvested. The canes were crushed at the East Indian Distilleries Factory, Nellikuppam, by Messrs. Parry & Co., who also analysed the juice of some of the varieties. Of the varieties *B.* 1529 has surpassed others both in weight of cane per acre (20 tons) and in coefficient of purity of juice (89·36). The other varieties which have come into favour with Messrs. Parry & Co., are *Fiji B* and *J.* 247.

(*f*) *New crops.*—Some of the crops now grown on the farm are considered *new* in that they have not in previous years taken a definite rôle in the experiments. These crops include *Cambodia cotton, onions, chillies* and *tapioca* which are to be included in a definite rotation experiment with groundnut.

Cambodia cotton has given the low yield of 523 lbs. kappas per acre.

Onions gave an outturn of 9,500 lbs. per acre on plots planted with seedling onions, and 8,540 lbs. on plots planted with bulbs. As the latter is the local practice, this experiment to test the merits of the methods of planting is to be continued. In addition to the increased outturn the seedling system entails considerably less initial expense.

Chillies and tapioca are standing crops and figures are not yet available.

Fodder cholam gave an outturn of 5,319 lbs. per acre this year as compared with 1,820 lbs. in 1913–14. The best season for sowing this crop in this locality has not yet been determined.

16. *Distribution of seeds, etc.*—The appended list gives the extent of distribution of seeds implements, etc., from Palur :—

	LBS.
Greenmanure seeds	41,014
Paddy	9,595
Indigo seed	7,385
Groundnut	1,663
Miscellaneous seeds	191
	Number.
Scind ploughs	27
Monsoon ploughs	22
Triangular harrows	9
Improved country ploughs	6

In the preceding year the Ramagarudansamba variety of paddy, which is a Palur single plant selection, had reached the field scale. The whole of the paddy was distributed on seed farm conditions to be transplanted singly. Five thousand Madras measures of seeds were recovered at the end of the season from the Zamindar of Chunampet to be distributed to applicants in the forthcoming season.

17. This year again some difficulty has been experienced in obtaining ample water from the adjoining channel for irrigation purposes. This complaint is constantly recurring. The Revenue officials now propose constructing a dam with vents to ensure fair distribution of irrigation water to the parties concerned. Reliable experimental results cannot be expected on those plots which do not receive their normal supply of water from the channel. A satisfactory solution to the difficulty is an urgent necessity.

18. *Stock.*—Sixteen bullocks were maintained on the farm, three were sold owing to old age, one died, and four young bullocks were bought.

19. *Visitors.*—The event of the year was the inspection of the farm by His Excellency the Governor Lord Pentland who expressed his satisfaction with the work done. It is reported that 557 literate visitors inspected the farm.

20. *Buildings.*—The necessary repairs were executed.

21. *Staff.*—M.R.Ry. S. Subramania Ayyar was in charge of the farm until 28th October 1914, when he was temporarily relieved by Assistant Farm Manager, C. V. Seshachari pending the arrival of Farm Manager M.R.Ry. A. V. Tirumuruganatham Pillai from the Central Farm, Coimbatore, on 12th November. Assistant Farm Manager C. V. Seshachari assisted in the management of the farm until 30th June 1914 when he was posted to District work in South Arcot with Palur as head-quarters. Two newly appointed Assistant Farm Managers K. Ramayya and K. Gopalakrishna Raju joined duty at Palur on 29th May and 1st June, respectively. K. Ramayya availed of leave on loss of pay from 17th July 1914 to 14th August 1914 when he was transferred to the establishment of the Government Economic Botanist. Gopalakrishna Raju who was relieved by Assistant Farm Manager N. V. Visvanatha Ayyar was transferred to Koilpatti farm on 31st October 1914.

ST. THOMAS' MOUNT.
26th May 1915.

R. THOMAS,
Dy. Director of Agr., Central Division.

APPENDIX III.

ADMINISTRATION REPORT OF THE GOVERNMENT AGRICULTURAL CHEMIST FOR 1914–15.

I have the honour to submit herewith my report for the year ending March 31st, 1915.

2. I was in charge of the office during the whole of the year but the following members of the staff were granted privilege leave :—

Name.	Designation.	Period.
M.R.Ry. M. R. Ramaswami Sivan ...	Chief Assistant ...	1 month.
,, P. A. Subrahmanya Ayyar...	Assistant... ...	1 month and 16 days.
,, P. A. Raghunathaswami Ayyangar.	Assistant... ...	1 month.
,, K. S. Subrahmanya Ayyar...	Head clerk ...	2 months.
,, C. V. Iswara Ayyar... ...	Second clerk ...	3 months.

3. There are no changes to report in the personnel of the staff with the exception of that of the second clerk C. V. Iswara Ayyar who was deputed to act as second clerk for a period of six months in the office of the Deputy Director of Agriculture, Southern Division, Trichinopoly. During the interim a substitute was appointed to take his place.

4. The changes introduced by the revised curriculum of studies have had the effect of reducing the work in the Teaching section, and this will continue until the new third and fourth year classes are formed. No lectures were given in General Chemistry during the past year and as a consequence the Chief Assistant M.R.Ry. Ramaswami Sivan was deputed to give the lectures in Agricultural Chemistry which have hitherto been given by myself. At the Diploma Examination in Agricultural Chemistry held in March 1915, eighteen students presented themselves, and out of these eight passed in the first class and ten in the second class, and there were no failures or third-class passes. The tuition given by this assistant is excellent in character and great credit is due to him for the way in which he has carried out his duties during the year.

In conformity with the general scheme of lectures drawn up for the first year students I gave eleven lectures of a popular type on Agricultural Chemistry and sixteen lecturss on Physics and Meteorology were given by the second assistant M.R.Ry. P. A. Subrahmanya Ayyar.

5. During the year under review the following samples were analysed and reported upon :—

Soils	147
Manures	26
Foodstuffs and fodders	30
Sugar-cane and cane products	1,631
Dairy products	495
Oil-seeds	27
Water	66
Miscellaneous	5
Total ...	2,427

This is decrease of 326 on the previous year's total but is accounted for by the fact that it was necessary, for over four months of the year, to take two assistants from routine analytical work and to allocate to them the work of the sugar-cane breeding station and the Guntur survey. In these circumstances it was only found possible to carry out a comparatively small amount of dairy work. Of the samples analysed only 115 were from ex-departmental sources but of these 53 were done on bahalf of cultivators. A large proportion of the samples of water were received from the Kistna Delta in connection with an enquiry relating to the suitability of the water in certain drains for irrigation purposes.

6. The soil survey of the Guntur Delta is progressing rapidly and as only a very small number of samples await completion the final report will be available about the end of June 1915. Soil maps based on the analyses of the alternate samples were prepared for the Agricultural and Industrial Conference held in Madras in December last and those of the finished survey will not differ materially from them.

7. During the year a memoir was published dealing with the relationship between the gases present in paddy soil with the organized film found on the surface of the soil. It has been shown that the latter utilized the former in such a way as to lead to an increased amount of oxygen being available for root aeration, and as the gas mainly concerned is produced by

the decomposition of organic matter in the soil the connection between green-manuring and increased aeration of the roots has become apparent. At the same time it has been possible to place the theory of the effect of drainage on a firmer and more satisfactory basis.

8. The experiments instituted to elucidate the source of the gaseous nitrogen in paddy soil have been carried out over a period of several years and may now be said to be nearing completion. It has been shown that this gas only accumulates in quantity when there is a crop present in the soil and that the volume of the gas is largely dependent upon the presence of nitrogenous organic matter. Similar results are obtained when the crop is grown in sand in the presence of organic matter, whereas, when grown in sand in the presence of mineral manures only, no gas is produced although very good plants are raised. These results undoubtedly point to the source of the nitrogen being largely the organic matter present in the soil and manure and lead to the conclusion that the beneficial effect of green manuring lies chiefly in its biological and physical aspects and not in its direct manurial value.

9. A few years ago it was shown that the beneficial effect of drainage on paddy was closely associated with the production of a deeper root system and this observation has been followed up during the past year. In the experiments it has been found possible to induce deep root action, even when the effect of drainage is eliminated, and in every case this has lead to increased cropping power. An attempt to apply this principle in actual field practice has failed owing to the unsuitability of the method adopted so that future experiments will be mainly concerned in finding a method suitable for practical application. Incidentally these experiments would appear to show that the toxic effect of decomposing green manure in badly drained soils has been overestimated.

10. The work connected with the carbon cycle in paddy soils is being continued but although very promising and most suggestive results have been obtained it is not possible at present to make any definite conclusions.

11. The study of the coliform bacteria associated with the bud-rot of cocoanut palms has been abandoned. Although these organisms probably accelerate the rate of rotting yet it has not been found possible to find any connection between them and the incidence of the disease. These results are entirely at variance with those of the investigations carried out in the West Indies, which make these bacteria the responsible agent, and it would therefore appear that in India the specific agent is the fungus.

12. Some further progress has been made with the compilation of data referring to the composition of South Indian footstuffs and fodders but not so much as one could wish owing to the urgency of other analytical work. The analytical data will however be added to as opportunity occurs.

13. During the year I spent 42 days on tour and the members of my staff a total of 115 days.

COIMBATORE,
28*th April* 1915.

W. H. HARRISON,
Government Agricultural Chemist.

APPENDIX IV.

ANNUAL REPORT OF THE GOVERNMENT ECONOMIC BOTANIST FOR 1914-15.

I have the honour to submit my annual report for the year 1914-15.

Staff.—I was in charge of the office throughout the year.

M.R.Ry. G. N. Rangaswami Ayyangar was confirmed as Assistant and Assistant Farm Manager, M.R.Ry. K. Ramayya was transferred from Palur as assistant on probation in the sub. *pro tem* post from 15th August 1914.

Fieldman, N.V. Viswanatha Ayyar was on sick leave from 19th August 1914 to 31st October 1914 when he was transferred to Palur as Assistant Farm Manager. Fieldman, P. V. Raghavendra Rao was granted privilege leave for six weeks.

The Storekeeper's post was abolished and two new posts of Plant Collector and Laboratory Attendant were created and filled.

Tour.—Provision had been made for extensive touring but it was found impossible to carry this out without neglecting important work at head quarters. The large number of different varieties of paddy under observation gave very considerable range in duration with the result that there was a constant supply of fresh material requiring examination daily.

My tours which were confined to paddy tracts amounted to forty full days and those of the staff to 18 days.

Crops.—As reported last year paddy was the main crop to receive attention and cotton was given as much time as possible without handicapping paddy work. This time, as had been

expected, proved to be too little for anything other than a definite restricted field of work as noted below.

Paddy.—Last year's selections provided a mass of extremely interesting material the examination of which kept the whole staff at work continuously for about four months.

The former surmise that extensive crossing takes place proved to be correct. Of the plants slected as variations from the type, 79 lots out of 171 were crosses and showed splitting for various characters. The material specially designed to show the amount of natural crossing at Coimbatore gave the following results which will be seen to vary with the variety:—

	Per cent.
Sadai Samba	3·7
Swarnavari	·9
Dodda Birru Bhatta	·1

A line of Raskadam growing as a border to plots of other varieties showed crossing to the extent of 1·3 per cent., 2 per cent. and 1·5 per cent. for three different varieties respectively. Further material has been taken to show the amount of crossing at Samalkota and Palur.

In the crosses which, as above mentioned, gave splitting families the characters were examined with regard to their method of inheritance. Altogether a very large number of characters was involved of which many were simple and well marked. A preliminary account of some of these characters was given in a paper to the Indian Science Congress on "Some Mendelian characters of the paddy plant." Definite simple Mendelian ratios were obtained for thirteen well marked characters and considerable information recorded regarding more complex characters. A large amount of material has been taken for throwing further light on the latter next season.

The harvesting of small lots for the determination of the probable error in estimating yield was continued and the results were about the same as last year.

The total number of lots to be carried forward next year amounts to 610. Of these about 200 are for studying the inheritance of specially important economic characters, 200 for complex morphological characters, and 134 pure lines.

Last year mention was made of the desirability of taking up a new piece of land for paddy work and this year proposals were submitted and Government sanction obtained for the acquisition of about 17 acres of land for a paddy breeding station. As the full amount of money could not be provided in next year's budget, modified proposals, providing for an area just sufficient for next year's crop, were submitted.

Cotton.—On account of the limited amount of time available for cotton work it was decided to confine attention to Cambodia crosses and selections.

Last year's crosses of Cambodia with Bourbon and Spence grew well and in addition to being very productive gave a lint superior to either parent. Plants were selfed for next year's F_2 generation.

Crosses were made between Cambodia and an annual form of Bourbon, quite distinct from the Erode Bourbon mentioned above which is apparently identical with the Spence supplied by the Cotton Specialist.

The Cambodia single plant selections showed considerable variation in ginning percentage which varied from 31 to 36 per cent. Little other variation was found except for one lot which was splitting and obviously derived from a cross with Sea Island or a similar variety.

Botanical garden.—The planting up of the garden was continued and many fruit trees, ornamental trees and shrubs, borders, etc., were put in. A back entrance for carting purposes was made and a culvert built for this purpose. Irrigation facilities were further improved and a cement channel nearly 200 yards long was put in, which admits of the cotton plots being irrigated without the second lift which was necessary before.

About 400 young trees were distributed for planting on the estate in addition to many cuttings and ornamental plants. The pruning of trees on the estate was carried out by the garden staff.

Seed testing.—Germination tests, which were done before by the Lecturing Botanist's section were transferred to this section. During the year 88 tests were made for other offices in addition to those in connection with the keeping of paddy seed.

F. R. PARNELL,

20th May 1915. *Government Economic Botanist.*

APPENDIX V.

ADMINISTRATION REPORT OF THE GOVERNMENT LECTURING BOTANIST FOR 1914-15.

I have the honour to submit my annual report for the year 1914-15.

2. *Staff.*—The temporary establishment consisting of one assistant, one fieldman and one plant collector continued to work during the year. K. Chinnaswami Pillai who was permitted to take up an appointment in Ceylon was permanently transferred and Ramaswami Raju who entered service as temporary fieldman was made permanent on 1st October 1914. Jobitha Raj who acted for K. Chinnaswami Pillai was placed in temporary appointment from the 1st October 1914 and he continued therein till 5th November on which date he resigned. This place was lying vacant till the 8th January 1915 when K. Raghavachari an assistant farm manager was appointed and he continued in the said office till the end of the year.

3. *Leave.*—The chief assistant was on privilege leave for 21 days, the temporary assistant for 15 days and the temporary plant collector for 14 days during the year.

4. *Tours.*—I was on tour for 53 days in the districts of Chingleput, South Arcot, Salem, Coimbatore, Malabar and South Canara on botanical excursions accompanied by a plant collector and a fieldman. The temporary assistant and the plant collector visited Hassanur and Dhimbam ghats of the Satyamangalam taluk Kollimalais of Trichinopoly, and Golkonda of Vizagapatam and their tour lasted for about 60 days. Mr. Jivanna Rao, the teaching assistant, went on a collecting tour with a fieldman and a plant collector to the Kallakad hills in the Tinnevelly district and was in camp for 17 days. The Artist went to Madras during the Christmas holidays for painting the water hyacinth (*Eichhornia speciosa*) for the Director of Agriculture.

5. *Teaching.*—The new course of studies came into force during the year and the first year students received instruction in accordance with the syllabus laid down. There were 28 classes for the first year students. The course in Agricultural Botany for the second year students of the old Diploma course consisted of the study of several crops, plant breeding, plant and its relation to environments, etc., and 57 lectures and 60 practical classes were held during the year for them.

6. The diploma examination was held in December and together with a student from the previous year 18 sat for the examination and 17 passed (2 in I class, 6 in II class, and 9 in III class) and one failed. In the botanical teaching of the college much stress is laid on the physiological aspect and students take much interest in all physiological experiments. But to make the teaching on these lines really interesting and useful an experimental plant house is absolutely necessary. Large number of both dry and spirit specimens have been secured for use in the laboratory and most of the physiological experiments were successfully conducted in the laboratory. A set of 100 weed seeds were prepared for the use of students and about 100 sheets of weeds were added to the collection for the same purpose. The relative weight of 1,000 seeds and the number of seeds in 1 lb. of seed sample for about 43 kinds of seeds of economic use were determined in the laboratory and the results were communicated to the Principal for the Agricultural note-book. Some specimens were prepared for the College Museum.

7. The Artist prepared 95 drawings of farm weeds and other plants and supplemented the collection of drawings in the laboratory and most of the drawings made were found useful for the Manual of Botany now in the press.

8. *Systematic Botany.*—The forwardal of specimens to Mr. Gamble was continued and 3,664 sheets (from *Heynea trijuga* to *Stylosanthes micronata*) from the herbarium were forwarded to Kew together with copies of Dr. Barber's drawings of parts of plants up to Ampelideæ and 39 paintings of Balsam. Further consignments of plants were stopped on receipt of a letter from Mr. Gamble asking not to forward specimens till the sea route is safe.

9. The tours made by the Government Lecturing Botanist and his staff resulted in a collection of about 2,000 specimens including also several fruit samples. During the year 2,746 sheets were mounted from the recent collections and 832 of Mr. Gamble's small sized specimens were mounted on standard sheets; of the sheets mounted 754 from the general collection and 832 of Mr. Gamble's were incorporated during the year.

10. The drawers in the large work table were provided with 800 small tin boxes and about 300 specimens of fruits were identified and arranged in them.

11. Mr. Fischer kindly sent about 70 specimens to the herbarium. Specimens of plants were identified for various correspondents as follows:—21 were identified for the Government Mycologist, 57 for Rev. Munch, 52 for Rev. Pfleiderer, 6 for the planting expert and 44 for

various other correspondents. Short notes were prepared in answer to the queries of various correspondents on *Berberis aristata, Albizzia moluccana, Datura, Butea, Marsilea, Ocimum viride* and different kinds of reeds used for mats.

12. A list of plants collected in the Kannoth range was prepared and forwarded to the District Forest Officer, North Malabar, at his request. The study of weeds of the Central Farm was completed and the idea of publishing descriptions as leaflets was given up as it would take a very long time to complete it. Instead of this it is proposed to publish the descriptions, etc., in the form of bulletins soon as the study of the weeds of the other farms is completed.

13. The chief assistant Mr. C. Tadulingam prepared a paper on the Madras Flora and read it before the Science Congress at Madras in January. The Government Lecturing Botanist and the Temporary Assistant also attended the Congress.

14. Hon'ble Mr. Cardew visited the Herbarium and the Laboratory during the year.

K. RANGACHARIAR,
Government Lecturing Botanist.

28th April 1915.

APPENDIX VI.

ADMINISTRATION REPORT OF THE GOVERNMENT ENTOMOLOGIST FOR 1914-15.

Staff.—The Sericultural Fieldman's post was extended until the end of June 1915. Fieldman D. Ponnayya resigned his post in order to take up an appointment under the Fisheries Department and C. K. Subrahmanyan at that time second clerk was appointed to succeed him.

2. *Tours.*—(i) The Government Entomologist was 76 days on tour in Bellary, Kurnool, Salem, Kollegal, Tiruppur and Mettupalayam. He also visited Pusa to attend the conference of entomologists from various provinces.

(ii) First Assistant spent 89 days on tour in Ganjām, Salem, Kollegal and also accompanied the Government Entomologist to Pusa.

(iii) Second Assistant was on tour for 59 days in Bellary, Kurnool and Anantapur.

(iv) Third Assistant who was in camp during some days of every month was away from head quarters altogether 163 days. The districts visited were Malabar, Coimbatore, Salem and Chittoor.

(v) The fieldmen spent 189 days in camp in Bellary, Kurnool, South Arcot, Pudukottai, Chittoor, Tinnevelly, Salem and the Nilgiris.

3. *Leave.*—(i) First Assistant had privilege leave for 23 days, second Assistant for one month, head clerk for one month and 10 days and head artist for one month.

4. *General Work.*—(i) Only some 35 specimens were received during the year with requests for advice in dealing with insect pests. Demonstrations in methods of destroying insect pests of different kinds were given in Malabar, Kilacheri and Puduceri.

(ii) A big campaign was planned against the Deccan grasshopper but owing to a variety of causes it ended in failure. It may be noted at this point that in the year under review climatic conditions would appear very largely to have done the work of destruction contemplated by the section.

(iii) The problem of the destruction of the mango crop by mango hopper being acute, an experiment founded on the experience gained last year was conducted in the mango tope at Varagambady belonging to the Salem Zamindari. This experiment and demonstration was in every way most successful and a 75 per cent. crop should be assured to anyone using the methods advised. Thanks are due to Mr. E. B. Stevenson, C.I.E., Agent of the Salem Zamindari, for the invaluable assistance given during the experiments in mango hopper control.

(iv) The fish oil soap made by the Fisheries Department was found most useful in this work.

(v) Another success has been the ascendency which has been established over the mosquitoes on the Agricultural College estate at Coimbatore. The success is not absolute, for it is impossible entirely to eradicate all mosquitoes from the place and the presence of an extremely dirty village tucked into one corner of the estate somewhat prejudices the chances of more complete freedom being attained.

(vi) A prolonged experiment was undertaken to test the efficacy of light traps for checking the paddy stem borer. Though the experiment at the time of writing is not completed, everything points to the fact that some other means must be sought for combating this most serious pest.

(vii) A series of experiments was undertaken and is still in progress at the Government sugarcane farm at Chettipalayam with a view to testing various methods of preventing damage to cane setts by termites.

(viii) In addition to the above various insecticides have been tried but no very startling discoveries have been made.

(ix) Control of pests through baits is indicated as one of the chief factors in Economic Entomology of the future and a certain amount of work on those lines has been done in the present year.

5. *Laboratory and Insectary work.*—(i) The general collection has been added to and the work of reducing the various specimens to order has gone on steadily under the charge of the First Assistant.

(ii) Various insects have been named by the Imperial Bureau of Entomology and the Imperial Entomologist, Pusa, and a collection of Rhyncota very kindly presented by Dr. Campbell of the London Mission. To these gentlemen and to the Director of the Imperial Bureau thanks are due for their assistance.

(iii) In the Insectary the following life histories have been studied :—

Cholam bug, *Calocoris Angustatus* (Complete †)
Cholam bug, *Megacoelum Stramineum.* (Complete.†)
Small unnamed capsid on Cholam. (Partially worked out.†)
Pundaluoya simplicia. (Nearly complete.)
Cholam anthomyiid fly
* Cumbu and Panivaragu anthomyiid fly. } (Complete.†)
* Anthomyiid on rotting fruit. (Complete.†)
* *Cholam Cecidomyiid.* (Notes made.†)
* *Cumbu Cecidomyiid.* (Notes made.†)
* *Paddy Cecidomyiid.* (Notes made.†)
(Anikombu.)
Cotton Aphis. (Notes.)
Parasa lepida, slug caterpillar. (Complete life history worked out. Already done in Ceylon.)
Parasites and predators of above. (Notes.)
Several parasites on various sp. *Read and noted.*
Paddy stem borer. (*Schoenobius bipunctifer.*) (Study unsuccessful.)
Amsacta spp. Kumblipuchi (Breeding Experiments.)
Eupterote mollifera. (Complete.)
Adisura atkinsoni. (Complete.)

In addition to the above observations were made on various sp. including a flea * beetle on panivaragu, erotylid * on thenai, *sthenias grisator,* the twig girdling beetle, *sitotroga cerealella,* bruchids affecting pods in the field and others. The "Cholam," "Cumbu", and "Tomato" flies were until recently regarded as one species.

6. *Pests during the year.*—(i) The pests which have been chiefly complained of during the year under review are the paddy grassphopper (*hieroglyphus banian*), paddy stem borer (*schenobius bipunctifer*) and anaikombu disease in paddy. Swarming caterpillars were responsible for some damage in the Nilgiris and Malabar. Hairy caterpillars (*amsacta sp.*) and grasshoppers were also complained of in the southern districts of the Presidency.

(ii) In addition to the new pests noted above a Scolytid beetle has been reported from the Gōdāvari andNegapatam attacking and killing coconut trees.

7. *Publications.*—The following articles have been written by the section :—

(i) Life history of *Calocoris angustatus,* with coloured plate, note of a species of Fatua attacking thenai on the Central Farm, Coimbatore, Leaflet on the paddy grasshopper. In addition the First Assistant contributed a note to the Bombay Natural History Journal on the damage done by the moon moth (*actias selene*) to trees in the college compound and the Second Assistant replied to and corrected certain inaccuracies which appeared in an entomological contribution to the Journal of the Madras Students' Union.

8. During the present year the silk work has been concentrated in one village near Kollegal. Disease free seed was raised and sold to the ryots with a guarantee of its fitness. The subsequent rearing was carefully watched and advice given when needed. The results from this brood were good. There was some demand for these cocoons, Rs. 2-8-0 per 1,000 being paid, as much as one rupee above the usual market price. This was an encouraging sign showing that good stock will be bought if it is to be had.

(ii) Out of 38,000 diseased seeds found in seed examined by the sericultural fieldman 29,500 were found to be suffering from pebrine. These seeds were nearly all bought from Mysore dealers and these figures show how pebrine is being disseminated through the villages and threatening the existence of the industry.

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* These insects are *as far as is known reported as pests* for the first time. † New work.

(iii) Many visitors came to the rearing shed and in time a marked improvement should be made in the methods of sericulture in the village in which it is situated.

(iv) The origiual idea was for the shed to be in the taluk compound in Kollegal with a mulberry garden of its own near by. However after an outbreak of fire in the rearing shed the taluk compound was judged to be unsuitable. The remains of the burnt shed were abandoned and another rearing shed taken in Dodinduvadi which so far has suffered no mishap.

(v) Much assistance in sericultural work has been received from the Tahsildar of Kollegal, M.R.Ry. Nageswara Ayyar, who has been most helpful.

(vi) Experiments were made with univoltine eggs from France but without success. These will probably be tried again under different conditions.

9. *Teaching.*—Lectures were given by the Government Entomologist to the first year students under the new curriculum in Zoology and Entomology while the First Assistant lectured to the second year under the old scheme.

(ii) The artists were employed to prepare large coloured diagrams of insects for the use in lectures.

E. BALLARD,

1*st May* 1915. *Government Entomologist.*

APPENDIX VII.

ADMINISTRATION REPORT OF THE GOVERNMENT MYCOLOGIST FOR 1914–15.

I have the honour to submit my annual report for the year ending 31st March 1915.

2. I was in charge throughout the year. The laboratory staff was strengthened by the addition of a junior assistant sanctioned in G.O. No 226, Revenue, dated 7th August 1914, and he joined on the 28th of November. The two vacant fieldmen's posts were filled in November and both men seem to be of the right stamp. Six temporary fieldmen were appointed for three months during the monsoon for conducting spraying work against Mahali disease on areca-nuts in Malabar and South Canara. The posts of head artist and second artist were filled by men from the School of Arts.

3. The Second Assistant was on Medical leave twice for periods of one month and eleven days and six weeks. The two clerks had privilege leave for periods of two weeks and eighteen days respectively.

4. I was on tour for 107 days, the First Assistant for 127 days, the Second Assistant for 142 days, the Third Assistant for 19 days, the fieldman who was on duty throughout the year for 147 days and the Plant collector for 109 days. During the spraying season the Laboratory Attendant was also out for 90 days. Touring was done in the districts of Gōdāvari, Kistna, Guntūr, Kurnool, Tinnevelly, Salem, Coimbatore, Malabar, South Canara and the State of Cochin.

5. The bud-rot of palmyras and coconut palms was kept under observation. During the operations in Gōdāvari district the number of dead trees cut and burned was 28,709 while the number of infected trees operated on was 34,497, of which less than 1,000 died subsequently. In Kistna district the number of dead trees cut and burned was 3,204 while the number of infected trees operated on was 2,755, of which a very few have died subsequently.

In addition to these numbers more diseased trees have been found by examining all the larger trees in the infected parts of certain villages in which the disease is severe. This is a result of the experience gained in the isolated infected area of about 1,000 acres around Chikkala in Kistna district. There all the palmyras were examined by the special staff by stripping off from 10 to 15 leaf bases to detect the disease-spots. By the end of last year the palms wanted by the ryots for tapping had been examined and by the end of June of this year the other large trees (except 500 reserved by the owners for their leaves) had been examined. In all 20,831 trees were dealt with and of these 1,265 were found to have disease though they had not shown any outward symptoms. This proportion was so high that the method was extended to other villages and during the rest of the year in Kistna district 127,769 trees were examined and 9,193 of such cases were found and dealt with. This number is about one and a half times the number dealt with in the ordinary course of the operations in Kistna district. Similar work is being done in Gōdāvari district with like results. The disease is thus being dealt with much more intensively than ever before.

6. As a result of the patrol of the five-mile belt in the uplands round the infected area of Gōdāvari a small outbreak in a village near the coast beyond the known limit was discovered and dealt with.

7. A coliform bacillus isolated from the soft rotting parts of coconut and palmyra palms attacked by bud-rot did not produce any form of rot when injected in culture solution into

the interior of the buds of young coconut palms. This bacillus does not produce a bud-rot. The work was done in conjunction with the Government Agricultural Chemist.

8. The inoculations on coconut and palmyra palms of pure cultures of Pythium palmivorum Bult. were repeated and the results confirm last year's experiments. Butler's fungus is the cause of the bud-rot disease and the coliform bacillus in India does not itself produce the disease, though it may have some effect in hastening the putrefaction of the bud of a dead palm.

9. In Malabar district this disease on coconut palms seems to be widespread but only a few palms are infected in the villages examined and nowhere are trees being destroyed wholesale. Only 1,306 diseased palms were discovered by the special staff.

10. The investigation of a new disease of coconut palms that occurs on the West Coast was begun and the Forest Department has kindly put a plot of coconut palms at my disposal for inoculation work regarding it.

11. The demonstration of spraying areca-nuts with Bordeaux mixture as a preventive against the Mahali disease caused by Phytophthora omnivora var arecæ in the infected parts of Malabar and South Canara was again undertaken. More garden owners are interesting themselves in this method of prevention and are becoming more confident in the efficacy of the operation. One garden owner sprayed 5,500 trees entirely at his own expense. Seven sprayers were sold and the fruit bunches of over 29,000 trees were sprayed. The disease was slight this year in the villages in which this work was begun three years ago but is now severe on the coast region. In Hanaar where the gardens are dependent on labour from the coast the work was brought to a stand-still for lack of coolies.

11-A. A fungus on paddy (probably an Ephelis) which transforms the loose panicle into a solid carbonaceous spike was brought into pure culture and its biology was studied. Fieldwork will be begun in the coming season.

12. A fruit rot of chillies caused by Vermicularia capsici Syd. has almost been worked out.

A bacterium isolated from a black rot of plantains gave no results when inoculated into young plantain shoots.

13. From outside 36 bundles of specimens were received for identification of and advice regarding diseases and 21 applications were made for investigating diseases on crops. Fifty-nine specimens were sent to Herr Sydow for identification and 14 specimens of new fungi were sent to Pusa.

14. A three months' course on plant diseases was given to the students in the last term of the second year. As in the previous year it comprised a study of the life history of a few fungi and of the effects of fungi on their host plants with special reference to the diseases of the more important crops of the Presidency along with a study of the application of preventive measures. At the final examination 17 students presented themselves, of whom nine were placed in the first-class, seven in the second and one in the third. Dr. L. C. Coleman, Director of Agriculture, Mysore State, was the external examiner. The first year students under the revised syllabus also had six demonstrations.

WILLIAM Mc'RAE,
Government Mycologist.

30th April 1915.

APPENDIX VIII.

ADMINISTRATION REPORT OF THE GOVERNMENT SUGARCANE EXPERT FOR 1914–15.

I have the honour to forward the following report of the work done on the Sugarcane Breeding Station during its second year, April 1914–March 31, 1915.

2. I was on combined leave and deputation for 195 days (April 17–October 29) in England, during which time my Botanical Assistant, M.R.Ry. T. S. Venkataraman, was in charge. The Chemical Assistant was on privilege leave for 19 days. A new clerk and artist were appointed during the year and the staff was strengthened by the addition of a new Botanical Assistant, fieldman, plant collector and peon.

3. After my return, I was on tour for 88 days, visiting the Central Provinces and Shahjahanpur in December, and Bengal and Assam in February April. Besides studying sugarcane on the various farms and making excursions into the ryots' fields, I visited the pioneer undertakings near Sindewahi in the Central Provinces and in Kamrup in Assam.

A fieldman and plant collector were in North India for 54 days taking measurements of growing canes and my head peon (since raised to the position of plant collector) was in charge of the arrows at Hebbal for 61 days.

4. The land allocated for cane growing has been heavily dressed with municipal rubbish and tank silt, while madar (Calotropis gigantea) has been dug in or crops of green dressing added. For the latter purpose, Dolichos Lablab appears to be the most satisfactory on the salt land, and the crop dug in on some fields was as large as 8 tons per acre. The effect of similar treatment in the previous year has been seen in a general improvement of the canes grown. The North Indian canes have become green and healthy and appear now to be thoroughly at home, while the thicker canes have also done much better than before. The road from the Central Farm to the Cane Breeding station has been improved in various ways and has greatly added to the efficiency of the station. The sweet water well has been cleaned and revetted. The rainfall was 24·24″, an increase of 6 inches over that in the previous year. Its distribution was not however very good, as the crops suffered a good deal during July and August from drought and the unusual falls of over two inches in January and March did a certain amount of damage. The general result, however, is that the water level is higher than in last year and it is hoped that the well, which is always heavily taxed at this time of year, will hold out until the early monsoon rains relieve it. No use has been made of the Government permission to have the Chittrachavadi water channel turned on for the benefit of the farm.

One package of canes was received from the United States, and numerous varieties were collected by the Government Sugarcane Expert while on tour. Some 150 packages of canes were sent out to different parts of India. There are now nine Madras seedlings being grown in three places in North India for observation purposes.

5. The general planting of the cane varieties and selected seedlings of previous years was completed very late last year, many of the plots not being sown till June. This is undesirable, for to escape the heavy storms of Apiril and May and to save excessive demands on the well during the dry weather, the canes should be reaped by the end of March, that is, planted in February. An attempt has been made to correct this, and all the plots of varieties and selected seedlings (numbering some 800 plots) have already been planted and labelled. It is intended to plant in February next year and thus fall into line with the local practice.

One of the reasons for this late planting is that the cane requires at least a year to mature, and the planting out of seedlings is strictly limited by the arrowing season. The latter occurs between October and December, and the seedlings are not big enough to plant out until April-May and do not mature till rather later in the following year. Those selected for propagation cannot be planted before April to July at the earliest and some are later than this. I propose therefore to replant all selected seedlings each year by taking cuttings from the half grown plants in February and thus, so to speak, forcibly bring their maturing into line with the rest of the canes grown. This will mean the duplication of the selected seedling plots (carrying with it chemical analyses of the canes) in each year, and will involve an addition of some 200 to the already large number. The change will, however, have this additional advantage, that it will be possible to distribute such as are chosen for North India at a time when they can be planted successfully there. Last year, seedlings were sent up in June, an entirely unsuitable time, and these have not as yet matured sufficiently for us to judge as to their behaviour in the north.

6. Besides the general crop of varieties and the previous years' selected seedlings, the current year's harvest of new seedlings appears to be late, so late in fact that we cannot, as we did last year, forecast their character. This lateness has nothing to do with the time of planting, for that is uniform each year, but is probably caused by the heavy and unseasonable rains of January and March, at a time when the cane is usually rapidly ripening. The parents of these seedlings were, as a whole, of a better class than those used in the previous year and we have, therefore, some reason to hope that we shall have a better series all through.

Altogether 2,392 chemical cane analyses were made during the past twelve months, and I have pleasure in recording my indebtedness to the Government Agricultural Chemist for his continued assistance in this matter, nearly half of the year's analyses having been made by his staff.

Of the seedlings selected for further growth, 61 had over 17 per cent. of sucrose in the juice, 37 over 18 per cent., 8 over 19 per cent., and 2 over 20 per cent.

A good deal of work has been done in collecting existing analyses of different parents in various parts of India and a number of curves have been prepared to give us data as to what class of juice to expect from the seedlings of any given cane or combination of canes.

7. Although it is not safe to dogmatise, there are indications that we can draw certain conclusions regarding the behaviour of our seedlings, during the first year or two, when planted out under ordinary crop conditions. The seedlings when first taken from the nursery and planted in the field are put into specially prepared holes and accorded very good treatment. They respond to this and show very remarkable vigour. One case is recorded of a seedling producing 147 mature canes, 16 months after sowing the seed. When, however, they are cut up and planted for the second year in ordinary trenches, they are far less vigourous, but there is often a converse improvement in the quality of the juice. This increase in richness of juice appears to be maintained during the third year.

A further not altogether unexpected change has been noted during the present season, when some of the seedlings have been planted for the first time on the Central Farm wet or paddy land. Here, again, there appears to be a further improvement in the quality of the juice, sometimes to a very considerable degree.

These facts, taken together seem to justify the assumption that the chemical analysis of a new seedling does not overestimate the ultimate quality of its juice, while there is certain to be a very marked falling off in its vigour. An effort will be made during the present year to equalise matters, by treating the new seedlings less favourably and giving those planted out under crop conditions larger doses of manure. It is undesirable that the character of seedlings should change to any great extent, as this delays the selection work.

8. Hitherto, there has been little flowering of the canes on the cane breeding station, probably owing to the fact that the canes themselves did not grow well, before the land had been got into order. This entailed a considerable amount of labour in that the flowering shoots or "arrows" had to be brought from villages within a radius of ten miles round the farm. Various expedients were accordingly adopted to induce the canes to produce flowers at the farm and a series of "arrowing plots" were put down last year. Canes were also planted under the more normal conditions of the Central Farm wet lands, on a piece of ground kindly placed at my disposal by Mr. Wood, and others were distributed to Samalkota and Taliparamba farms. A good measure of success has attended these efforts, and it was not necessary to collect a single arrow from any village during the season; the arrowing plots were a mass of flowers, and a useful series was also obtained from the Central Farm. The canes also flowered freely at Taliparamba and to a less extent at Samalkota. Added to this, arrows of certain varieties were obtained, as in the previous year, from Dr. Coleman at Bangalore.

One Hundred and twenty-six cages were placed for arrows, 46 crosses were attempted, 280 pans of seedlings were planted and over 23,000 seedlings were raised. The parentage of these seedlings was much more varied than in previous years and, on the whole, the class of parent showed a further general improvement. In one respect our results have, however, been disappointing. Although 12 North Indian canes were induced to flower, some for the first time known, most of these flowers turned out to be in-fertile. The large series of attempted crosses between hardy Northern canes and rich Southern ones have not therefore produced much result. It is hoped that, as these Northern canes become better acclimatised to their novel conditions, the fertility of their flowers will likewise improve. A large proportion of the better varieties among them have now been planted in the arrowing plots and the paddy lands.

9. Special studies were made in various directions as time permitted. Considerable progress was made in the study of the Morphology of seedling canes. A large number of analyses was made, by the Chemical Assistant, of the canes growing on salt lands and certain marked peculiarities in their juice were noted. Sugarcane pollen received a large amount of attention during the short arrowing season, and arrangements were perfected for sending the pollen of arrows from place to place and thus to cross canes at a distance. The depressed habit of certain seedlings was studied as well as the erectness of the young shoots of the different varieties grown on the farm. As a result of a series of sowings, the vitality of cane seed was found to be greater than previously supposed. The Government Entomologist, desiring to make experiments with a view to checking the ravages of white ants, a number of plots were prepared for him from time to time. A series of experiments were made with charcoal, wood and saw dust for the packing and preserving of canes, tins being opened fortnightly for a period of two months; and a number of other pieces of work of greater or less importance were commenced.

The following papers were prepared by the Government Sugarcane Expert during the year, all but the last, which is preliminary, being printed:—

Studies in Indian sugarcanes.—1. The Punjab canes—Memoirs of the Indian Agricultural Department.

The sugarcane in India.—International Congress of Tropical Agriculture, London, June 1914.

The classification of Indian sugarcanes.—International Congress of Tropical Agriculture, London, June 1914.

Some difficulties in the Improvement of Indian sugarcanes.—Annals of Applied Biology, January 1915.

Sugar and the sugarcane.—The opening address before the Botanical section of the Madras Science Congress, January 1915.—A somewhat abbreviated form of this address will be printed in the Agricultural Journal of India, July 1915.

The Depressed habit of the sugarcane.—A preliminary note read before the Madras Science Congress in conjunction with M.R.Ry. T. S. Venkataraman, Botanical Assistant.

10. I have, in conclusion, to record my appreciation of the work done by the staff during the year, especially in the scientific section where a good deal of independent observation it being commenced by my assistants.

C. A. BARBER,

29th April 1915. *Government Sugarcane Expert.*

APPENDIX IX.

(i)

REPORT BY MR. H. C. WILSON, PISCICULTURAL EXPERT, ON INLAND PISCICULTURE IN MADRAS PRESIDENCY, 1914-15.

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2. I was in charge of the piscicultural operations during the year under report as Piscicultural Expert and was engaged on tours of inspection and special investigations.

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5. *Sunkesula Fish Farm.*

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The general work at the farm progressed satisfactorily and a large head of fish was secured and kept in the several farm ponds for stocking purposes; but unfortunately owing to the breaching of Tangadencha tank three times, the stocking of Kurnool-Cuddapah Canal was not possible for want of sufficient water and hence only the first 20 miles was stocked. It may however be remarked that the breaching of the Tangadencha tank will have a most deleterious effect on the fishery of the canal for a few years to come. This tank which never ran dry contained a lot of good breeders and the canal was replenished every year with fish from this source. To make good this loss will mean the re-stocking of Tangadencha from Sunkesula for many years. Many thousands of murrel fry, etc., were however removed from the farm and turned out into the Edurur Swamp for growing purposes.

The new and valuable larvicide "Polyacanthus cupanus" referred to in my last year's annual report have since bred in the farm. A portion of the Hindri river close to the Kurnool Collector's bungalow and the Markapur tank were stocked with this useful larvicide.

Another interesting item of work done at the farm was the introduction of tench (Tinca vilgaris). A small consignment of tench and the English carp were brought from the Nilgiris and turned out into the breeding ponds.

* * * * *

7. *Hilsa Hatchery.*—During the year under report my Sub-Assistant went to the Lower Anicut to attend to this. He waited for several days and though almost all female hilsa caught were in a gravid state not a single ripe one could be had. As the water in the river went low and there were no further runs of fish, the hatchery work was closed for the year.

8. *Stocking of Tanks and Canals.*

* * * * *

Daroji tank in the Bellary district and the Markapur tank in the Kurnool district were stocked with fish from the farm in September and October last respectively; the latter tank, however, was again stocked in December with carp and mosquito larvicides.

Besides the above two tanks another tank which holds permanent water, viz., Peddamentrala in Markapur taluk of the Kurnool district was also stocked.

10. *Nellore Fishery.*

* * * * *

The site selected is in the bed of "Ippur" tank about 11 miles from Venkatachellam station on the Madras and Southern Mahratta line. The water is supplied by an open channel from "Survapelli" tank and the Public Works Department records show that the water-supply in this tank, if carefully guarded, should not fail to supply the fishery excepting in years of great drought.

The construction of a well has been provided for and a small pumping plant to insure against the above danger and for other necessary work. The plans of the fishery and buildings have been perused by the Public Works Department and the works sanctioned by Government in G.O. No. 2997, dated 14th October 1914.

The work is now in the hands of the Executive Engineer of Nellore and will be completed this year.

11. In July I inspected several wells in Tondiarpet, Madras, with Captain Hodgson, I.M.S., in connection with the anti-malarial operations. Many of the wells that had been stocked with larvicides, were examined and found absolutely devoid of mosquito larvæ.

The danger of the present method of stocking with fish larvicides was pointed out to Captain Hodgson, viz., the liability of introducing eggs of predaceous fish with the larvicides.

The present system of gathering the small fish from surrounding ponds is an exceedingly bad method and it is almost a certainty that eggs of predaceous fish, especially the floating eggs of the Ophiocephalidæ family, will be accidentally carried.

In some of the wells visited which had been already stocked, we found the small fish larvicides had all disappeared and it was evident that some predaceous fish had been introduced.

On completion of the larvicide farm at Nellore the small fish can be sent for stocking purposes free of all this danger.

12. *Acclimatisation of tench.*—With reference to G.O. No. 1601, Revenue, dated 3rd June 1914, sanctioning the above scheme, a consignment of tench was brought from the Nilgiris in February last and turned out into "Jeejur tank" and another small tank close to Mattigiri near Hosur; as mentioned under "Sunkesula Fish Farm" a small consignment of tench was put in one of the ponds of the fish farm at Sunkesula. The result of the experiment will be reported to Government in due course.

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15. *Nilgiris.*—In May the streams of the Nilgiris were inspected to decide the opening date of trout fishing and the same month the following rivers were restocked with large trout from the reserve stream in Parson's valley, viz., Pykara (upper reaches), Krurmond, Meemund below falls, Kondah river below McIver's bund and Billiter Halla.

16. *Acclimatisation and introduction of live fish food to the Nilgiris.*—In September a valuable consignment of live fish food was brought from the Moyar river near Torapalli to the fish ponds and river at Pykara.

The same month the following new streams were stocked with trout, viz., Tiah Shola stream (Kondas), waterfall stream, Piermede stream, and Bangi tapal stream.

The supply of eggs at the Avalanche hatchery was fairly good and trout were kept for transhipment to the Travancore ranges, etc. The rivers are fully stocked with trout and some very large fish have been seen.

A consignment of tench was sent to Wellington to restock the lake.

* * * * *

18. During the year under report the Cauvery and the Coleroon fisheries have been taken over by Government paying the District Boards concerned a fixed annual compensation. To improve this fishery it is absolutely necessary to prevent the wholesale indiscriminate slaughter of fish which takes place during the annual fish drive in the Cauvery near Hoginkal (Salem district) as well as dynamiting, etc. With the help of the Collector of the District as well as the District Forest Officer the annual fish drive has been put an end to during the last four or five years, besides dynamiting as well as other illegal methods of capturing fish. Through the co-operation of the District Forest Officer, Salem, fishing licenses will be issued for a nominal fee for capturing fish in the river within the forest boundary and the size of mesh of the nets used will also be regulated.

* * * * *

21. *Miscellaneous.*—During the year under report correspondence with the Public Works Department has enabled us to compile a list of all the tanks in this Presidency which contain more or less permanent water. These will be inspected as time permits and methods adopted to improve their fisheries aud take them over to our department.

Many municipalities were advised as to the best fish larvicides to stock their waters with, but the request of some to be supplied with a stock of larvicides could not be complied with until the "Ippur" fish farm is working.

(ii)

REPORT BY MR. JAMES HORNELL, F.L.S., MARINE ASSISTANT, ON MARINE PISCICULTURE IN MADRAS PRESIDENCY DURING 1914–15.

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Considerable advance was made, particularly in respect of fish-farming in backwaters.

* * * * *

4. Tuticorin fish farm was completed in January 1915 and stocked with mullet, whiting (Sillage sihama) and other quick-growing backwater fishes. Hardly had this been done when an unseasonable and exceptionally heavy rainfall occurred throughout the Tinnevelly district

entailing in the river villages very serious losses wherein the fish farm unfortunately participated to the full. A considerable portion of the palisading was damaged and could not be repaired till the floods subsided. The fish fry were scattered and stocking had to be undertaken a second time in March; we cannot therefore expect growth to be so satisfactory or the stock to be so large as it otherwise would have been had normal conditions prevailed in January. The work done has, nevertheless, already added largely to our knowledge of the fauna of the lagoon and of the life histories of several of its more important constituents. A very satisfactory feature is the great abundance of two of our most valuable Indian prawns. Not only do these species grow to a large size and form excellent eating, they also constitute a valuable bait for the line fishermen of the port. These men for years past have been handicapped by a shortage of this bait, so when I found that prawns were thriving greatly in the fish farm, it appeared obviously sounder economically to exploit this resource specifically for the benefit of these men than to dispose of the catches to the general public as food. Accordingly special store baskets were devised in which the catches made during each day are stored till the early morning of the succeeding day when the line fishermen come for their supply; this I hope to put right next season when more normal weather conditions may be expected to prevail than was the case during the past year.

5. The line fishermen greatly appreciate this boon of bait storage and supply. Hitherto it has been a common occurrence for them to be delayed unduly in the mornings as the lack of storage facilities meant that they had to wait the actual daily capture of prawns before they could get to sea; I have seen men sitting on the shore till 9 A.M. waiting for the prawners to catch a sufficiency of bait. Now they can usually get to sea by 6 A.M. as all they have to do is to go to the prawn store and buy what quantity they desire.

6. *Oysterculture.*—Growth of the stock on the beds at Pulicat proceeded most satisfactorily throughout 1914, and at the beginning of January 1915 they had recovered from the set back they annually receive during the ordinary rainy season of October and November. Unfortunately the exceptional and heavy rains which occurred towards the end of January and which, as already mentioned, occasioned ill effects in the Tuticorin fish farm, were equally well marked at Pulicat and this second flood of fresh water threw the oysters back two months in condition so much so that sales had to be suspended temporarily during February and March. Low salinity continued for an unduly long period after the floods subsided and indicates that a backwater with a relatively small area is preferable for oysterculture to one of much greater extent whenever the sea mouth of the latter is restricted in size.

7. *Pearl culture.*—Further steps have been taken towards the acquisition of the necessary site, the preparation of final plans, and the training of the Senior Operator.

8. The opportunity of pearl fishing in Palk Bay in August and September 1914 enabled a number of pearl inducing experiments to be tried; the requisitioning of the nspection Schooner for war service at Madras brought these to an untimely end and for the present they are necessarily in abeyance.

9. The oysters fished in Palk Bay last year were remarkable for the frequent "smokiness" of colouration in a large proportion of the pearls produced. To some extent the nature of the shell shared in this peculiarity, due it would seem in some way, to the influence of the muddy environment in which these pearl oysters lived; instead of living attached to rocks and stones scattered over a clean sandy bottom as is the characteristic of the best pearl banks in the Gulf of Mannar, the Palk Bay oyster beds consist of a muddy sand, without rocks or stones, the oysters living attached to other bi-valves or to small dead shells.

10. Last year's observations furnish strong evidence that in the Palk Bay oyster beds we have discovered the source whence are periodically derived the spat which are necessary to re-populate the Ceylon and Tinnevelly pearl banks. It is now eight years since the last Ceylon pearl fishery (1907) and as no deposits of spat have been found either there or on the Tinnevelly beds in the interval, there was a strong presumption that the permanent breeding stock does not exist in the Gulf of Mannar but is located in Palk Bay; there is evidence that these latter beds although never before fished have been persistent for years, particularly one which has been located recently to the north-east of Rameswaram town.

11. Bottle drift experiments have been regularly carried on during the past year and enough material has now been collected to permit of conclusions being drawn. A report is now being prepared on the subject together with another showing in great detail the comparative *statistics* for the past three years *of the fishing industry at Tuticorin* selected as a typical East Coast centre. For the first time in the history of Indian fishery investigation the relative abundance and actual catch and value of all the important food fishes at the different seasons are tabulated, together with the different quantities taken respectively by each of the different methods of fishing practised at this port.

12. Two students, one sent by the Government of Baroda and the other by that of Travancore, were given courses of instruction in Marine pisciculture and in oysterculture during the course of the year.

Government of Madras.

REVENUE DEPARTMENT.

Recd.	1915.	*Enclosures*
Regd.		*Spare copies*

G.O. No. 1949, 26th August 1915.

Agricultural Department

Recording, with remarks, the report on the operations of the — during the year 1914-15.

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

Read—the following paper :—

Proceedings of the Board of Revenue (R.S., Sur., L. Rds. and Agri.), No. 215, dated 28th July 1915.

The Hon'ble Mr. Ll. E. Buckley, I.C.S.,

Commissioner of Revenue Settlement, Survey, Land Records and Agriculture.

The Board begs to submit to Government the report of the Director of Agriculture on the operations of the Department of Agriculture for the year 1914–15.

The most notable events of the year were the admission of twice the usual number of students to the Agriculture College as a result of the institution of the new courses, the holding of an Agricultural and Trade Conference in Madras in December 1914 and the receipt of the Secretary of State's sanction to the reorganization of the department. This last provides for seven divisions in the Presidency, the establishment of more district agricultural stations, the recruitment of a trained district staff in every district, the co-ordination of the prospects of assistants in the scientific sections at the College with those of men on the executive staff and a general improvement in the pay and prospects of most of the men in the service.

2. *Staff.*—Mr. Chadwick, I.C.S., was in charge of the office of the Director of Agriculture throughout the year. Mr. Hilson, deputy director of agriculture, northern division, was absent on six months' leave, Mr. Thomas, supernumerary deputy director, being in charge of the division during his absence. Mr. Sampson was single-handed in the southern division owing to the transfer of his assistant director to the northern division to replace the local assistant director who was posted to the agricultural College as assistant principal. Mr. Thomas was reposted to the southern division on Mr. Hilson's return from leave. Dr. Barber was away on leave for a little over six months, and M.R. Ry. T. S. Venkatarama Ayyar held charge of his office. Mr. Mehta's services were dispensed with on the termination of his probationary period at the close of the year.

3. *Buildings and laying out of agricultural stations.*—No new agricultural stations were opened during the year, but an additional area was obtained on lease for the Samalkota agricultural station, while a stretch of waste sand dunes was added to Hagari. Sanction was accorded to the construction of rooms for 40 more students at the college. It is not stated what progress has been made with the construction of these buildings and of the 19 more houses sanctioned for the residence of the employés at the College of Agriculture.

4. *Agricultural stations.*—During the year under report there were ten agricultural stations at work. They had their full share of the vicissitudes of the season. The more recent additions, Anakapalle and Sirvel suffered most, the former from a flood and a cyclone and the latter from a shortage in the supply of water due to a breach in the Kurnool-Cuddapah canal which cut off all supplies for the rest of the year. Notwithstanding this scarcity of water at Sirvel, it is satisfactory to note that the green manure crops proved a success, although the succeeding paddy crop died. This station has been primarily opened to demonstrate the value of green manure in the cultivation of paddy crops under the Velgodu project. In spite of the irregularities of the season, the Director remarks that some very good crops and useful results were obtained. The activities of the department during the year centred mainly on the selection of seed and of the best varieties of crops, the reduction of seed rate with a view to the economic transplantation of paddy, the use of manures and the method of dealing with the diseases affecting the palmyra palm in Gōdāvari and Kistna and the cocoanut palm in Malabar. A concise summary of what the department has done during the year will be found in paragraph 57 of the Director's report.

Sugarcane.—The year under report showed a considerable expansion of work in connection with this crop especially in Vizagapatam where it was possible to make a beginning by the establishment of the Anakapalle agricultural station. In South Canara, the variety known as the Red Mauritius has now been established in 150 villages, the total area under it being 424 acres as compared with 194 in the previous year and 84 in the one previous to it. Iron crushing mills were unknown in the district six years ago but their use is now rapidly spreading. The cultivation of sugarcane is also reviving in Malabar under the stimulus of high prices. A start has been made in introducing improved furnaces into the Chittoor district, which should enable the raiyats to earn an increased profit of Rs. 15 in converting each acre of cane into jaggery.

Cotton.—Work on this crop was confined to the Tinnevelly, Bellary and Kurnool districts. The progress of work in Tinnevelly was particularly gratifying. There were 20,000 to 22,000 acres under departmental seed, which is more than double the area obtained in the previous year. In 1913–14 only three villages took the produce from departmental seed direct to the ginning firms without the intervention of middlemen and obtained their own seed back pure. In the year under report the number of these villages increased to 20. The Director anticipates very great possibilities in this system of joint sale both as a means of profit for the cultivator and as a means of spreading new types. The formation of co-operative societies to help this movement has not yet been possible. In the Ceded Districts also the progress was very satisfactory.

Paddy.—There continues to be a very keen demand in the neighbourhood of all the agricultural stations for the surplus seed which is always sold slightly above market rates—a clear index of the excellence of the departmental seed. The practice of reducing the seed rate continues to spread. For the first time since the agricultural department introduced the system of single seedling transplantation, complaint comes from portions of Shiyali and Mayavaram taluks that this system of transplantation affects the fertility of the soil after the first three years and it is reported that the raiyats in these parts are now transplanting seedlings in twos and threes. Even this means a considerable reduction in seed rate. The Director considers that if it had been possible to keep in these taluks the officer who started detailed work in the district in the first instance, no difficulty would have been experienced by the raiyats in obtaining green manure for the proper manuring of the fields said to be exhausted. It has been possible in the year under report to post a man once again in these two taluks, and consequently there has been a much larger sale of green manure seed than was anticipated. The Director observes that in all these operations the importance of preparing the seed-bed carefully in the first instance and sowing it thinly has to be borne in mind. It is possible that the difficulties in Shiyali and Mayavaram may have been due to seed-beds not having been thinly sown.

Green manuring.—This important branch of the agricultural department's work was highly successful in parts of Trichinopoly and in the Sholavandan circle of the Madura district. In the Madura circle work did not progress so well as in Sholavandan, mainly because the area was larger and there was a change of officers. In Malabar the cow-peas were grown for green manure although they were adversely affected by the absence of the rain in April-May. It is satisfactory to note that daincha is getting a start around Mangalore.

Palm disease.—The altered method of combating this disease in Kistna and Gōdāvari referred to in the last year's review has been persevered with. Under this method, not only are dead and diseased trees operated upon but a system of examining all the trees in the infected area has been introduced first in Kistna and then extended to Gōdāvari. Although this is a large undertaking, it is calculated to produce more satisfactory results than any previously obtained, as is evidenced by the fact that at the end of the year 27 villages in Kistna were removed from the infected list. As remarked last year the disease affecting the cocoanuts in Malabar, though widespread, is not so virulent. In view of this fact and the fact that the methods of dealing with the disease have been amply demonstrated to the raiyats, it is in contemplation to withdraw altogether from these operations in Malabar.

5. The above is a brief retrospect of the work done in the districts. But a very great deal of exceedingly useful work is being done in the scientific sections at the College. Mr. Harrison's investigations on the effect of green manure crops on paddy deserve particular mention, as also the completion by him of the soil survey of the delta portion of the Guntūr district.

6. *Sugarcane breeding station.*—Very careful work has been going on at this station. Some 150 packages of selected cane were sent to the stations in Northern India. These included some Madras seedlings which were sent specially for observation purposes. The analysis of last year's seedlings shows that 61 of the Madras seedlings gave over 17 per cent. sucrose, 37 over 18 per cent., 8 over 19 per cent. and 2 over 20 per cent. The Director observes that these figures are very satisfactory because the sucrose contents of some of the best varieties of recently imported canes ranged between 16 and 20 per cent.

7. *Agricultural instruction at the College of Agriculture.*—The year was noticeable for the introduction on the 7th June 1914 of the revised curriculum already referred to. Under this, instruction in the first two years is devoted mainly to general agriculture and its allied occupations such as dairying, cattle feeding and rearing, care of implements, etc. It is possible to take in ordinarily 40 students a year for this course. Those who wish to prosecute their studies further may be taken for an additional 18 months' course devoted mainly to the sciences as applied to agriculture. As a fact, 42 students were admitted. The year thus opened with a total strength of 74 in the college and closed with 70 in residence. The spread of improved methods of agriculture has been hitherto impeded by lack of qualified men in the department. Under the new scheme now in force at the College, the department will have a much larger annual supply of qualified men to carry on its labours and those of them who are not absorbed in the department will revert to their own farms and will, it is hoped, become centres of influence for the propagation of improved agricultural methods. Fifteen students went up for the diploma examination and all of them were successful.

8. *Agricultural associations and exhibitions.*—Of the old district associations Ganjām continues to do good work as also Coimbatore and Madura. The village associations in Malabar, about 25 in number, have also done well. Five co-operative agricultural societies have been formed for the joint purchase of manure, etc., but most of them have not as yet had a full year's work so that it is premature to express any opinion about them. Cattle shows were held at Ongole, Tiruppur and Madura.

9. *Meteorology.*—The rainfall registered at the various rain-gauge stations in the Presidency was tabulated as usual and the results were published by the Meteorologist, Madras, and the Deputy Director of the Madras Observatory. The total number of rain-recording stations in the Presidency at the end of the official year 1914-15 was 477 inclusive of 83 in the Native States and Coorg against 475 at the end of the previous year. Of these 388 were inspected during the year.

10. *Statistics.*—The following returns were published in connection with local enquiries under provincial direction: (i) monthly season reports in three sections, rainfall, cultivation and prices of food-grains and salt, and (ii) two half-yearly reports of cattle mortality.

11. The year has been one of undoubted progress both in the districts and at the college. The Board endorses the Director's appreciation of the work of the officers named by him, and desires to express also its recognition of the good work done generally throughout the department, a result of the hopefulness, energy and determination to succeed which characterize the Director.

(True Extract.)

T. RAGHAVIAH,
Secretary.

To the Secretary to Government, Revenue Department.
„ Director of Agriculture.

Order—No. 1949, Revenue, dated 26th August 1915.

Recorded.

Miscellaneous.

2. Mr. Chadwick's report contains a full and interesting narrative of the activities of the Agricultural Department and of the results achieved during the year 1914–15. The outstanding features of the period under review are summarised in paragraph 57 of the report and have been touched upon in the Board's Proceedings and the Government note with pleasure that there has been continued progress and development in several directions.

3. The introduction of the revised course of studies at the College and the reorganisation of the department have already formed the subject matter of separate press communiqués. These events mark the beginning of a new stage in the agricultural development of the Presidency and with the growth of the staff available for work in the districts a more rapid and widespread improvement in agricultural practices and methods may reasonably be anticipated.

4. The scientific sections at the College have, as usual, conducted important investigations and experiments and the Government are pleased to observe in particular that Mr. Harrison's researches on the gases emanating from paddy soils have earned for him the degree of D.Sc. from the University of Leeds.

5. The Government have once again to express their appreciation of the good work done generally by the Director and the other officers of the department.

(True Extract.)

L. DAVIDSON,
Secretary to Government.

To the Board of Revenue (Revenue Settlement).
,, Director of Industries (through Educational Department).
,, Honorary Director of Fisheries.
,, Educational, Local and Municipal, Public, Judicial and Public Works Departments.
,, Agricultural Adviser to the Government of India.
Copy to the Government of India, Department of Revenue and Agriculture } with C.L.
,, ,, Department of Commerce and Industry }
Editors' Table.

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